A FRAMEWORK FOR ENHANCING PROJECT QUALITY AND CUSTOMER SATISFACTION IN GOVERNMENT ROAD CONSTRUCTION PROJECTS IN RIVERS STATE, NIGERIA.

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ABSTRACT

Satisfaction has consistently been a source of concern to clients, stakeholders and customers in the construction industry globally. In Nigeria, despite the huge financial investments in construction and its associated economic benefits, construction projects are characterized by poor quality in aesthetics, high costs in maintenance and failure to meet or exceed the customers' quality expectations. An even greater challenge is faced when considering government construction projects as re- occurring issues like on time delivery, operational and aesthetic excellence and even project abandonment continue to resurface. Although previous studies have developed models and frameworks to improve customer satisfaction in product and service organisations, researchers have not treated in detail issues involving customer satisfaction within projects which do not have profits and financial gains as the driving force such as government construction projects. The aim of this research was to develop a framework that would identify particular areas associated with project quality where adequate resources could be channelled in order to enhance customer satisfaction in government road construction projects in Rivers State, Nigeria. Sequel to an extensive literature review, a conceptual framework was developed to establish the relationship between three attributes of project quality namely performance, reliability and aesthetics and two attributes of customer satisfaction measured through contractor re-patronage and referral. 503 road construction practitioners within the Port Harcourt metropolis of Rivers State, Nigeria participated in a quantitative survey and data obtained was subjected to stepwise multiple regression analysis. The results showed that a strong, positive and significant relationship existed between the attributes of project quality and customer satisfaction with project quality explaining 54.8% of the variance in contractor re-patronage and 61.8% of the variance in contractor referral. Performance was however found to have the greatest effect on contractor re-patronage (R^2=.550, adjusted R^2=.548) while aesthetics had the highest effect on contractor referral (R^2=.572, adjusted R^2= .571). Reliability was found to have the weakest effect on customer satisfaction and could be attributed to its civil and structural Engineering links which are either unknown or invisible to the customer. 10 structured interviews with construction professionals were used to validate the developed framework and justify the research design. The findings support the framework and suggest that the knowledge and analysis of the construction costs, the use of competent professional experts, the provision of a revised legal framework for road construction, delegation of responsibility for road maintenance, avoidance of project abandonment, identifying and mitigating construction risks, adopting a strategy for project monitoring, enforcing health and safety considerations, provision of innovative excitement factors as well as post project evaluations were essential for enhancing project quality and customer satisfaction from government road construction projects. The study advocates for an adoption of the framework and concludes by making recommendations including the incorporation of government and private construction practitioners and further identifies areas for future study.

DEDICATION

This thesis is dedicated to the Almighty God, who through his mercies, grace and favour brought me to this expected end. May His name be praised forever, Amen.

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DEFINITION OF TERMS:

APM BOK: Association for Project Management Body of Knowledge

BPF: British Property Federation.

BSI: British Standards institute

CIOB: Chartered institute of builders

CTP: Construction Time Performance

GCPs: Government construction projects

GORCOS: Government Road Construction Satisfaction Framework

I.T. Information Technology

MOD: Ministry Of Defence

MOP: Ministry Of Power

MOW: Ministry Of works

OGC: Office of Government Commerce

OSL: Optimal Satisfaction Level.

PMBOK: Project Management Body of Knowledge

QCC: Quality control circle.

QFD: Quality functional deployment

RIBA: Royal Institute of British Architects

ROIC: Return on Invested Capital

TQM: Total quality management

UKBA: United Kingdom Border Agency

Aesthetics: Project aesthetics is defined as an attribute of project quality which entails the physical and visible aspects of the constructed project.

Construction Project: a branch of production which involves the erection or reconstruction of structures and/or buildings for financial gains or infrastructural development, carried out to achieve a particular purpose within specified limits of quality, cost and time and bring about change in the process.

Construction: Construction in the context of my research was defined as the branch of production which involves the physical act and art of transforming designs and plans into concrete tangible structures.

Customer: A customer, when considering construction projects is defined as a person, or group of people who purchase, pay for, or utilize the construction product or service.

Government Construction Project GCP: A project initiated and owned by the government especially for infrastructural development rather than profits of financial gains.

Performance: Project performance entails the activities that ensure that the project fulfils this intended purpose and satisfies the expected need

Project quality: The nature of a project when combining it's apt for meeting specified requirements and satisfying the desired need.

Project: A project refers to a unique temporary activity carried out within the constraints of time, cost and quality, to achieve set out objectives that bring about change.

Quality: Quality in the light of this research is defined as the positive worth of a product or service in relation to its conformance to requirements, suitability for use, and potential for ensuring satisfaction.

Referral: contractor referral is a process where a contractor is given reference to carry out a particular job and hence may be selected in preference to another during the bid and tender process

Reliability: Reliability is defined as the probability that an item would perform its required function without failure within the constraints of set out conditions and time

Re-patronage: Contractor re- patronage refers to a situation where a contractor is called upon to carry out a construction project based on the feedback from previous construction activities

Satisfaction: Satisfaction is defined as a psychological phenomenon describing the emotional state resulting from an evaluation of the perceived discrepancy between prior expectations and the actual performance of the product.

1. CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter presents an overview of the approach employed in carrying out the research on improving customer satisfaction through the quality of Government construction projects in Nigeria. The chapter commences with the background to the research, stating the research problem, the choice of the research area, the research aim and objectives and the questions the research is set out to answer. The methodology employed is also highlighted in this chapter as well as the limitations of the research. The chapter concludes with an outline of the thesis organisational breakdown.

1.2 The rationale and problem statement

Construction projects all over the world are usually faced with challenges which span through the planning of the project, to its final execution (Johnson *et al.*, 2002). These challenges amongsts others include on- time delivery, quality management, effective leadership and managing available funding. Furthermore, Okoye *et al.*, (2015) identify an emerging trend in construction where the construction activities not only deliver the desired project but are geared towards satisfying its users otherwise known as the customer. Johnson *et al.*, (2002) add that these challenges have varied effects on the concerned stakeholders. Smith *et al.*, (2001) and Al Nahyan *et al.*, (2012) categorised stakeholders as direct or indirect participants who have a vested interest and can make a contribution to the success of the proposed project. Traditionally, these stakeholders include Architects, Project Managers, Civil Engineers, Government regulatory bodies, Customers, amongsts others (Al Nahyan *et al.*, 2012; Obunwo *et al.*, 2013). According to Olander and Landin (2005), there exists diverse ways in which construction projects affect stakeholders, the customer being a major branch of the stakeholder group. The availability of funding, movement of materials and supplies, organisation of labour and resources all play a vital role in the nature of satisfaction experienced by the various stakeholders (Olander and Landin, 2005; Masrom *et al.*, 2013; and Xiong *et al.*, 2014). Identifying a consensus satisfaction criteria for the various stakeholders is quite a tasking process as each individual possesses his / her requirements for satisfaction. These challenges and issues butress the importance of addressing the various demands of the stakeholders, especially the customer in managing construction projects.

With regards to a construction environment, depending on the type of project, the customer is interchangeably referred to as the end user or the client (Dikmen *et al.*, 2004). However in the

course of this research, the definition of the customer, a key part of the stakeholder group, will be limited to the end user and citizenry who latently pay for the infrastructural development projects through taxes and internally generated revenue. Dikmen *et al*., (2004) and Okoye *et.al.,* (2015) further posit that satisfying the needs of customers to construction projects was of uttermost importance and the expectations from such customers defined the quality characteristics of the project. Construction projects in developing countries, such as Nigeria face the same challenges as customer satisfaction in construction projects are negligent or not usually achieved. Ahmed and Kangari (1995) and Adenikinju (2003) posit through surveys carried out that the satisfaction expectations of clients in the Nigerian construction industry were not achieved. This was chiefly due to the fact that there were questions on the durability and sustainability of the projects, its construction to fit purpose, and the large financial involvement associated with maintenance of the project. In addition, with constructed roads failing to meet the desired expectation of delivery time and durability, the knowledge of key areas to invest greater resources seemed unknown to construction practitioners. These were an indication of poor quality or the absence of effective quality management (Okoye *et.al.,* 2015) and consequently, the need for developing a framework that addresses these issues became imminent. Quality however, in the context of this research is defined as the positive worth of a product or service in relation to its conformance to requirements, its suitability for use, and its potential for ensuring satisfaction (Palaaneeswaran, 2006; Nzekwe-Excel, 2012). Admittedly, road construction projects are heavily centred on Civil Engineering activities. However, Adenikinju (2003) identifies that there exist possibilities of optimizing project success and thereby enhancing satisfaction by improvements in the management of construction projects. Hence the need to look into the management of quality in carrying out government road construction projects in Nigeria, with the hope of identifying areas that need more attention or would possess higher contributions to the achievement of satisfaction from government road construction projects.

1.2.1 Nigeria as a construction haven for construction activities.

Nigeria is chosen as a case study area as it falls into the Newly Industrialised Country (NIC) category, which involves countries with a boom in the construction sector (Crosthwaite 2000). Similarly, Goldman Sachs (2005) identifies Nigeria as one of the next in line countries with a high potential for economic growth and a consequent boost in the construction industry. According to World Bank (2011), Nigeria with a population of approximately 162 Million people had a Gross Domestic Product growth (GDP) of 6.6% in 2011, against 3.5% in 2001(World Bank, 2011). More recently, the Nigerian National Bureau of statistics affirm

that the building and construction sector recorded a growth of 13.25% in 2012. This was attributed to the increase in construction activities in the power sector, road and rail construction both driven by the Government and private institutions (National Bureau of Statistics, 2012). GDP which is defined as the "*Sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products*" (World Bank, 2011), is an indication of economic health. A steady growth in GDP is an indication of growth in businesses, jobs and personal income, which is of great concern when considering the Nigerian construction industry.

According to Crosthwaite (2000), the NIC's have the highest share of Gross Domestic Product (GDP) dedicated to construction. Crosthwaite (2000) identified that as countries tend towards development, the additions to GDP from construction decreases. In other words construction accounts for a greater part of the increase in GDP of countries that fall under the NIC category, of which Nigeria is a part of, when compared to advanced developed countries such as Brazil, Russia and China. Lewis and Ruddock (2009) further add that construction projects alone account for 6% of GDP of developing countries obtained from a research on selected developing countries over a 36 year period. According to Lewis and Ruddock (2009), GDP is a measure of the growth of an economy, and an indication of the satisfaction experienced by the citizenry in such an economic growth. It will however be imperative to achieve this 6% increase in GDP or more from construction projects in Nigeria, buttresing the need to improve on the quality of construction, and in turn government construction projects.

However, customer satisfaction in Government initiated projects in Nigeria remains a persistent issue. Many of these Government projects are characterised not only by poor quality which leads to high costs in maintenance, but also by a negligence of the voice of the end user, i.e. the customer (Sweis *et al.,* 2008). Authors such as Ahmed and Kangari (1995); Adenikinju (2003); Idoro and Patunola-Ajayi (2009); Olateju *et al*., (2011) and Igbokwe-Ibeto (2012) highlight issues facing the Nigerian construction industry such as cost overruns, poor choice in materials, aesthetic and design failures, project abandonment and customer dissatisfaction. These issues all have varied effects on the quality of the finished project and the potential of such a project to offer satisfaction. Quality in service related organisations was found to have a significant contribution to customer satisfaction because it is affected by various factors such as human interaction, physical environment, value, price, performance etc (Tam, 2004). Similarly, in a product setting, the attributes of product quality such as performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality (Garvin, 1984) were vital in obtaining customer satisfaction Jakpar *et al.,* (2012). However, in a construction environment which entails a combination of products and

services, (Maloney, 2002), addressing the issue of quality and its management was seen as a more concise way of dealing with the already established issues. Admittedly, especially in the Nigerian construction industry, each of the issues facing the industry could be addressed or researched on independently. However a focus on quality improvements gives a wholesome approach to addressing the construction issues mentioned especially because of its relationship to customer satisfaction. Consequently, the need to research into improving customer satisfaction in these Government projects by improving quality outcomes became imminent. Furthermore, Onohaebi and Lawal, (2010), identify that the Nigerian power sector generated only about 30% of the total installed capacity, and only about 35% of the roads constructed around the country actually alleviate the transportation needs of the users, of which Rivers State is not an exception. This, Onohaebi and Lawal (2010) pointed out was an indication of the poor maintenance culture within the society, and called for urgent steps to be taken to restore confidence of the populace and citezenry in Government projects. In conclusion, research by Johnson *et al*., (2002) suggested that across countries, customer satisfaction was found to be highest for competitive products, lower for competitive services and even lower for Government and public agencies further buttressing the need to research into improving customer satisfaction in Government projects.

1.2.2 Rivers State and its construction opportunities

Emphasis in this research however would be placed on the Rivers State of Nigeria, a state with an estimated income through tax and internal generated revenue (IGR) of about 283 Billion Naira, (over one Billion pounds-sterling) in 2011 (Amaechi, 2012). In context, Nigeria has 36 states of which Rivers state is one and situated in the southern part of Nigeria. The Central Bank of Nigeria, CBN reports that Nigeria's IGR in 2011 rose by 52% and stood at 11.1 Trillion Naira (Over one hundred billion pounds) (CBN, 2011). However, Asimiyu and Kizito (2014) highlight a decline in the growth rate of IGR, 20% in 2014 and argue that in the nearest future IGR may be unable to finance both recurrent or capital expenditures. Asimiyu and Kizito (2014) further call for urgent steps in diversifying the economy and ensuring that recurrent expenditure is reduced while optimising the activities entailed in capital expenditure. A typical example would entail identifying critical areas to channel finances, energy and resources in construction activities that would improve the quality of the constructed project as well as satisfy its users.

Considering the major sectors that hinge on infrastructural development through capital expenditure which include the ministries of works, power and housing in Rivers state, the 2012 budget (Riversstate, 2012) highlights that 42.2% of the income generated from taxes

and IGR was spent by the ministry of works in carrying out infrastructural development projects in 2011. In addition, 8.6% and 1.2% of the income generated from taxes and IGR was spent by the ministries of power and housing respectively in 2011 (Riversstate, 2012), thereby making the state one of the highest investors in infrastructural development projects and construction in Nigeria. Since the creation of Rivers State in 1967, there have been several infrastructural development projects initiated by the government to better the lives of its citizenry. Most recently for example, the Afam power station, designed to generate 420MW of electricity, (Ahiakwo, 2008), dualization of existing and creation of new roads around the capital, Portharcourt, (Newriversstate, 2011), and of late, the plan to spend 318 million dollars on the Portharcourt mono rail project which has already kicked off, and is intended to improve transportation around the state capital (Tribune, 2010). In comparison to other states in Nigeria, Rivers state invests a large amount of money into its development projects, hence the choice of researching into improving customer satisfaction in the Nigerian construction industry, using Rivers state as a focal point. Igbokwe- Ibeto (2012) sought to align the successful completion of local government projects in Nigeria to project monitoring and evaluation. Identifying that the success of a project depends on how it is managed, Igbokwe- Ibeto (2012) opined that the challenges of construction could be overcome through positive leadership, prudent management of resources, ability to attract competent personnel to manage projects, constant inflow of resource, the use of global best practices, reduction in corruption if not total eradication, etc. Similarly, Olatunji and Diugwu (2013) through their research on road construction projects in Nigeria showed that adequate and sustained funding was essential for proper maintenance and preservation of road infrastructure in Nigeria. They further made recommendations that emphasis should be placed on the strategic role of the road infrastructure and its economic benefits rather than the cost of construction, highlighting funding as a key determinant of project success. Although research has been carried out to aid project success and satisfaction, there is little or no research that quantifies the effect of quality on satisfaction and the question then arises; “What could be done to improve on the quality of road construction projects in Nigeria while concurrently enhancing the level of satisfaction obtained from such projects”?

1.3 Research Aim and Objectives

The aim of this research was to develop a framework that would identify important aspects of project quality where adequate resources could be channelled in order to enhance customer satisfaction from government road construction projects within Rivers state of Nigeria. In order to successfully fulfil this aim, this research is guided by the following objectives.

1. To investigate the understanding of construction practitioners on the relationship between project quality and customer satisfaction while handling government road construction projects. This would be obtained from an extensive literature review on quality management in construction and customer satisfaction while handling construction projects.
2. To determine the extent of relationship between the attributes of project quality which include Performance, Reliability and Aesthetics and the attributes of customer satisfaction which includes contractor referral and re- patronage while handling government road construction projects in Rivers State, Nigeria. This would be achieved through the development of a conceptual framework.
3. To identify the perception of construction practitioners on the attributes of project quality that enhances customer satisfaction. This would include obtaining quantitative data through field work on the interactions between the attributes of project quality and customer satisfaction within Nigerian road construction projects.
4. To find out what aspects of project quality have a higher potential for enhancing satisfaction. This would be based on analyzing data from No. 3 and evaluating percentage contributions and effect of each attribute of project quality on the corresponding attribute of customer satisfaction within road construction projects in Rivers State, Nigeria.
5. To develop the Government Road Construction Satisfaction Framework GORCOS employing the findings from No 4.
6. To further investigate the perception of construction practitioners on the identified precursors of customer satisfaction in construction. In-depth knowledge would be acquired through qualitative interviews on the prevalence, implementation and/or alternative approaches to the findings from No. 4.
7. To ascertain the validity of the GORCOS, ensuring its suitability, clarity, and robustness based on the findings from No 6. This would be used to encourage the utilization of firms with a higher potential to ensure satisfaction from road construction projects.
8. To conclude on what aspects of project quality needed to be given more attention in order to enhance customer satisfaction within Nigerian road construction projects based on the findings from the research and make recommendations for future study.

1.4 Research Question

This research contributes to the growing research on customer satisfaction in Government infrastructure construction projects with a focus on the nature of the construction activities that impinge on the quality of the finished construction project. The research focuses on **'what'** could be done to reinstate and increase the confidence of customers to the Government through its road infrastructural development projects in Rivers State, Nigeria. The research addresses a number of questions summarized into one which is; "what aspects of quality management can be implemented or strengthened in the project life cycle of Government road construction projects in Rivers state to improve customer satisfaction"? However, in order to answer the main research question, the following questions were asked.

1. Within construction practitioners involved with government road construction projects, what level of awareness on quality and customer satisfaction exists?
2. Can the indices of project quality be used to predict customer satisfaction within government road construction projects?
3. What is the level of relationship between the attributes of project quality which include Performance, Reliability and Aesthetics and the attributes of customer satisfaction which includes contractor referral and re- patronage while handling government road construction projects in Rivers State, Nigeria?
4. Can there be a yardstick to measure the possibility of ensuring customer satisfaction from government road construction projects in Nigeria?

1.5 Significance of the study

This study is wholly dedicated to the enhancement of infrastructural development projects in developing countries, using road construction projects in Rivers State, Nigeria as a case study. The findings from this research will be useful to construction contractors to Government establishments, as well as organisations that intend to ensure the incorporation of customers' needs into their production processes. In addition, this research is aimed at identifying the specific quality attributes that influence customer satisfaction in carrying out construction projects in developing economies. In conclusion, this research is intended to add to the body of knowledge in managing construction projects in the Engineering management field, as well as the built environment.

1.6 Scope of the study

The scope of this study covers three main areas, these are; the content or context scope, the survey scope also referred to as the unit/level of analysis and the geographical scope.

1.6.1 The content/ context scope:

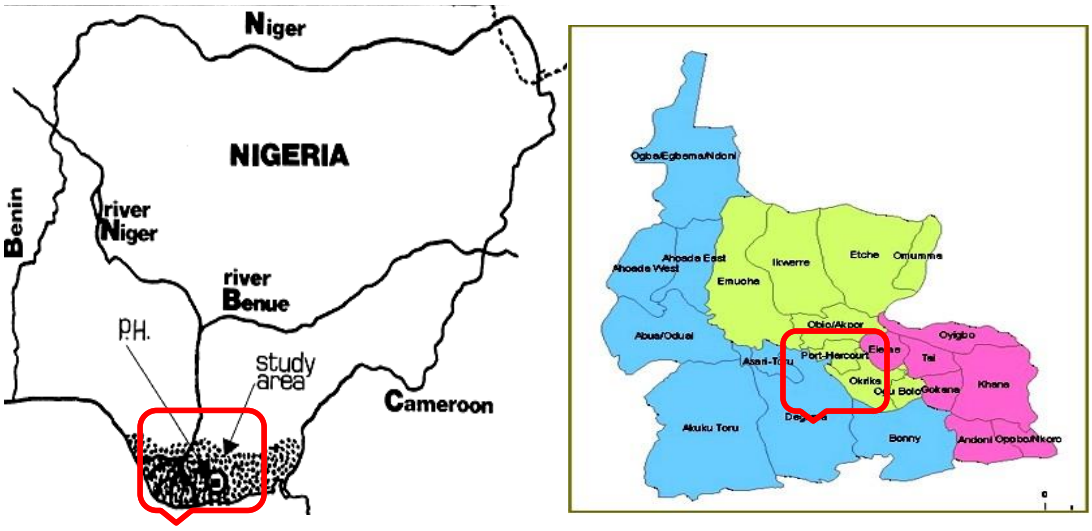
The variables of Project quality and customer satisfaction concepts are domiciled in Engineering Management. The study covers the extent of relationship between Project quality and customer satisfaction of Government infrastructure in Rivers State.

1.6.2 The survey scope:

This study adopts the macro and micro levels of analyses whereby the units of analysis are employees of the registered contracting companies within the Rivers State Ministry of Works engaged in road construction projects, staff of the Rivers State ministry of works, and users of the road with a broad view obtainable from residents and business owners in the concerned areas in Rivers State, Nigeria.

1.6.3 The Geographical scope

This research is geared at road construction projects within the Port Harcourt metropolis of Rivers State of Nigeria. Port Harcourt is the capital of Rivers State and entertains the majority of road construction projects and harbours the head offices of a vast number of construction companies. Figure 1.1 (a) shows the geographical map of Nigeria showing Rivers State and (b) shows the map of Rivers state showing the Port Harcourt metropolis.



a. Map of Nigeria showing Rivers state b. Map of Rivers State showing Port Harcourt.

Figure 1.1: Geographical maps of research scope.
Source: Google maps (2010)

1.7 Research Methodology

Research in construction management has been carried out using different methodologies and methods. Whereas a sector of the researchers in construction management believe that qualitative methods were more suitable for research in this sector, others believed that a quantitative approach could be employed to reach out to more respondents hence increasing

the validity of the responses. A new sector is developing on a fast pace, employing the pragmatic approach to research and utilizing both quantitative and qualitative research methods, otherwise known as the mixed-methods of research (Johnson *et al.*, 2007). Consequently, due to the research scope and the nature of the research questions which bothered on establishing relationships and identifying the extent of contribution of the attributes of project quality to customer satisfaction, a positivist philosophical paradigm was adopted for the research and quantitative research methods were employed to obtain data. A qualitative research method, in this case interview, was however employed in the framework validation. The findings are presented in the Government Road Construction Satisfaction Framework (GORCOS). However, prior to the empirical study, ethical approval was sought for and obtained to ensure that the research was carried out in a safe manner, the confidentiality of the respondents was guaranteed and the intellectual property of the research would be safeguarded.

In order to employ a quantitative research method, surveys in this case, the research needed to be conceptualized to have a pictorial understanding of what needs to be explored. Hence an extensive literature review was first carried out and involved electronic databases, academic journal articles, relevant text books, published conference proceedings as well as published Ph.D. Theses. This review informed the constituents of the conceptual framework which formed the basis of data collection and analysis.

The quantitative survey was carried out with the participation of 503 respondents which included senior officers in the Rivers State ministry of Works, employees with relevant knowledge from registered construction firms in Rivers State, as well as users with relevant knowledge on construction. The respondents were carefully selected based on set out criteria and chapter 4 gives a better insight into the nature of respondents sampled in the survey. Using the Statistical Package for Social Sciences (SPSS) software, data obtained was coded, and analysed using both descriptive and inferential analysis. The data was further subjected to Multi-Linear Stepwise regression analysis to establish the interrelationships between the variables explored and their percentage contributions to each other through the calculated R^2-values. A framework for promoting satisfaction from government road construction projects was further developed from the findings of the extensive quantitative study to guide construction practitioners on the provision of satisfaction from road construction projects. Validation of the framework entailed the use of interviews with professionals in road construction within Rivers State, Nigeria. The interviews were centered on ascertaining the importance of the themes in the framework, its prevalence and implementation, as well as

additions to the framework. Recommendations were further outlined as well as the implications of the research to policy, current practice and areas for future research.

1.8 Research Limitations

The major limitation to this research was the difficulty in obtaining information from the target organisations. Time constraints were also a limitation in this research as the researcher had to travel to the geographical location twice in order to carry out surveys. Also, although the sample size does not generally cater for the generalization for developing countries, but the findings are quite similar to what is obtainable in other developing countries.

1.9 Contribution to Knowledge

With the ever- increasing desire for firms and organisations to remain competitive while optimising value for money spent, this research contributes accordingly by providing a platform to enhance satisfaction from Government construction projects. Whereas road construction involves a lot of Civil Engineering activities which could be optimised, there is a perceived potential to achieve more success from the management of the road construction project (Igbokwe- Ibeto, 2012). Furthermore, this research is concerned with Government road construction projects which are chiefly for infrastructural development rather than private projects that are usually driven by profits and returns on invested capital. The main finding was the identification of key areas within the confines of project quality that had the potential to enhance customer satisfaction in road construction projects. This was achieved through the development of the Government Road Construction Satisfaction Framework GORCOS which serves as a guide to how construction practitioners can improve customer satisfaction from road construction projects, in other words, what currently needs to be done to enhance the satisfaction sought. Consequently, in the course of this research, the following were my contribution to knowledge and each of these contributions have been presented in conferences and published accordingly.

- Identified 25 quality management attributes that influence stakeholder satisfaction with projects in the construction industry as well as 10 key barriers to the implementation of quality management in the Nigerian construction industry.
- Established the relationship between project quality and customer satisfaction from a construction perspective through the conceptual framework.
- Quantified the effect of project quality on customer satisfaction through the use of Step-wise multi- linear regression analysis. Was able to find the percentage contributions of each independent variable to the dependent variable.

- Developed and validated the Government Road Construction Satisfaction Framework GORCOS. This framework is employed to ascertain the satisfaction requirements of organisations prior and post project execution.

In the course of this research, information found has been shared through conference proceedings, seminars, workshops and journal publications. Currently, two conference and one journal paper have been published while the full paper of a fourth journal publication is awaiting acceptance for publication. Citations for the publications can be found in the appendix.

1.10 Benefits from this research

The following are the identified benefits of this research and they cover academic, theoretical and practical benefits.

a. The research provided insights into areas that need improvements to obtain satisfaction in construction. Applicable to project managers, project contractors, government establishments, especially those involved with infrastructural development of their local communities.
b. The research made contributions to academic literature on quality and satisfaction in construction building on the findings from already existing literature.
c. This research provided a basis for improvements in the nature of construction activities within the Nigerian construction industry. The input themes in the framework aid the improvements.

1.11 Thesis organisational breakdown

The thesis is broken down into 8 chapters as illustrated in Figure 1.2. Chapter 1 covers the introductory aspects of the research stating the aim and objectives as well as the questions the research seeks to provide answers to. Chapter 2 presents the review of existing literature on construction projects and project quality in construction. Chapter 3 is a continuation of the review of literature and entails the theoretical underpins of satisfaction in construction. This section focusses on customer satisfaction in construction. The attributes of quality and satisfaction were derived from the review and were subsequently tested for its presence in Nigerian construction projects. Chapter 4 highlights the adopted research methodology employed in the research. The research paradigms and philosophy are detailed as well as the adopted research design and method of data collection employed. Chapter 5 entails the presentation of data collected for the research. Reports on the findings on the empirical quantitative study are presented in this chapter. The chapter further presents the analysis and

interpretation of data collected in the research. The methods of analysis, its advantages and limitations are stated in this chapter. Chapter 6 entails the development of the Government Road Construction Satisfaction Framework GORCOS based on the findings and interpretations of the data obtained. Chapter 7 presents the framework validation using interviews from experts in the Nigerian construction industry. The chapter further provides a justification on the achievement of the research aim and objective through the convergence of research findings with existing literature and academic validation. Chapter 8 concludes with recommendations for future study. The references consulted in the course of this research are then presented as well as the appendices referred to in this thesis. The breakdown is presented in figure 1.2

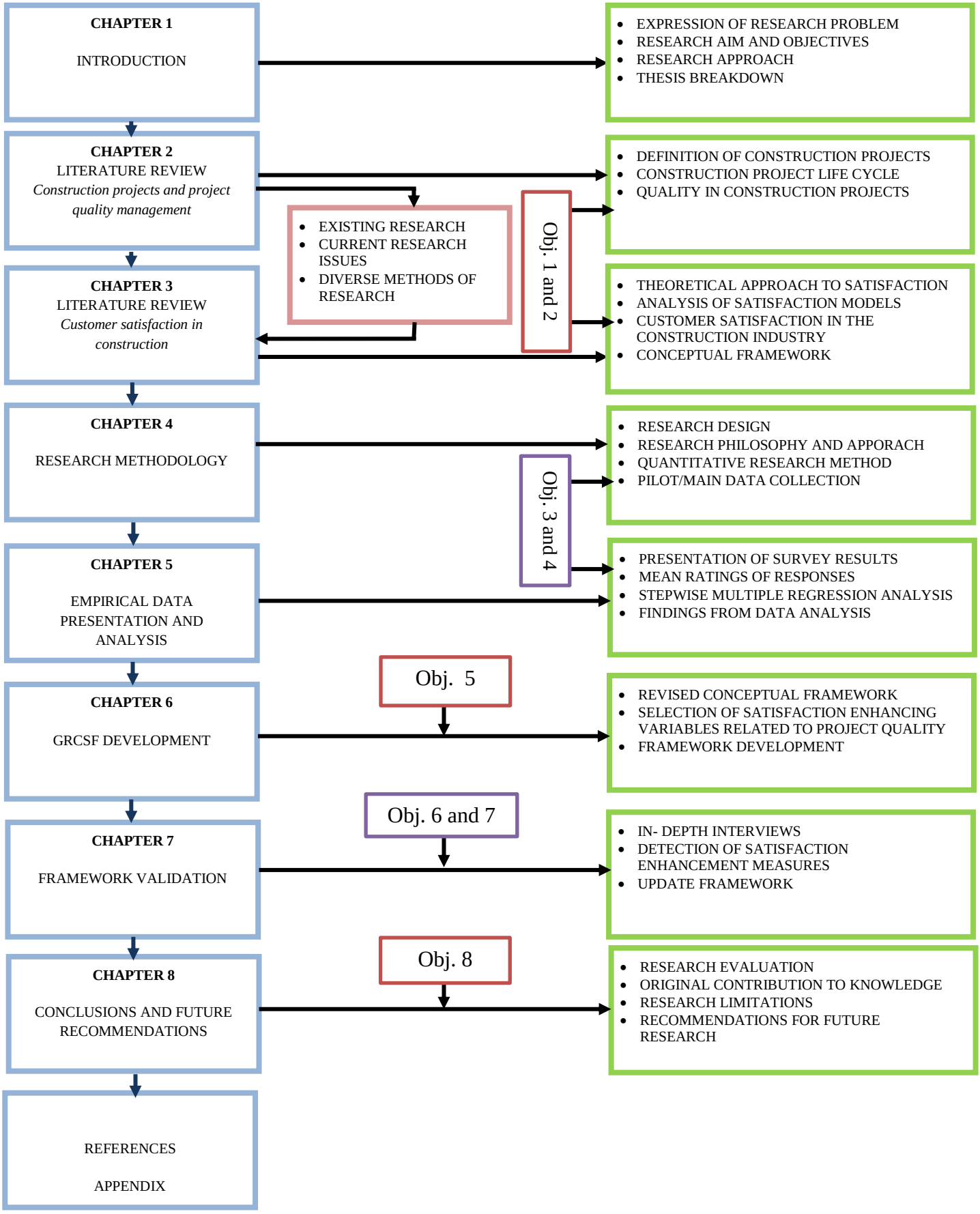


Figure 1.2: Thesis organisational breakdown

2. CHAPTER 2: REVIEW OF LITERATURE ON CONSTRUCTION PROJECT QUALITY.

2.1 Introduction

This chapter provides conceptual definitions and an in-depth understanding of construction projects and what they entail. The chapter highlights the diverse perspectives of authors on construction and adopts a working definition for construction. The relevance of construction to economic growth was also highlighted in this chapter. Sequel to offering working definitions for projects, the chapter concludes by identifying the activities of the phases in the typical construction project life cycle, in comparison to diverse project life cycles such as the RIBA project life cycle, the BS 6079, the Office of Government Commerce (OGC) and the Nigerian construction project life cycle outlining similarities and differences in relation to customer satisfaction.

2.2 What is construction? The concept of Construction.

Several definitions abound to the definition of the term construction and this depends on the context the term is used. The contexts cut across Geometry, Literature, Medicine and Engineering. However, for purposes of this research, the literature on construction is restricted to the Engineering context.

According to Torbett *et al*., (2001) construction is viewed as the physical act of carrying out designs created by engineers or Architects. This physical act has been observed to be essential to the development of cities, communities, residencies and industry. Torbett *et al*., (2001) see construction as a tool for environmental development, employing the skills and expertise of engineers and Architects to provide physical buildings, structures and industries. Whelton, Ballard and Tommelein (2002) from an Engineering / technological perspective view construction as a branch of production that entails the erection and reconstruction of various types of buildings and structures. These buildings and structures were either for private or public gains, or for infrastructural development (Whelton, Ballard and Tommelein, 2002). Giang and Pheng (2011) categorise infrastructural development into two broad categories, social and economic. Examples of social infrastructure development include investments in new factories, machinery, equipment and materials while economic infrastructure development includes investments in roads, rail lines, electricity, and communication amongst others. Although this research is interested in the economic

infrastructural development, both social and economic developments increase the physical capital stock of a nation, hence expanding its national output level (Giang and Pheng, 2011). Construction is very important in the actualisation and realisation of short and long term rural and urban development projects (Koskela, 2000; Whelton, Ballard and Tommelein, 2002). These authors attribute the development of advanced branches of industry, the improvement of living standards of the citizenry, as well as the preservation, reorganisation and restoration of the environment to the importance of construction (Koskela, 2000; Whelton, Ballard and Tommelein, 2002). The distinctive features about construction are that the product (being a part of a production process) always has a fixed location, the active assets of the construction organisation such as labour, equipment and machinery are mobile and there exists a relatively long production cycle which spans from several months to several years.

Major examples of Engineering constructions include industrial enterprises, public buildings and structures, roads and bridges, commercial structures such as vessels, dams, power generation plants, amongst others (Whelton, Ballard and Tommelein, 2002).

On the basis of the diverse views of construction above, this research adopts a definition for construction which is the branch of production that involves the physical act and art of transforming designs and plans into concrete tangible structures. However, construction cannot be carried out as a singular function as there surrounds diverse socio- economic interests such as stakeholders, the physical environment, the location and the available resources.

2.3 Relevance of the Construction industry

There is a high correlation between economic growth and the nature of the construction industry as economic growth influences the nature of construction projects in any economy (Moavenzadeh and Rossow, 1975; Hull, 2009). This is evidenced in the nature of the resultant construction boom in countries like the United Arab Emirates through its oil fuelled economic growth, and China through its industrial export driven growth, amongst others. The construction industry in China for example, has been driven by plans for new developments, and urban revitalisation (Oluwakiyesi, 2011). According to Oluwakiyesi (2011), between 1978 and 1999, China recorded a massive growth to 6.6% in construction as a percentage of GDP, from 3.8%. The World-bank (2010) in affirmation to the massive growth in China's GDP with respect to construction, highlights that construction accounts for 13% of China's GDP. Similarly, in the UK, the UKCG (2012) report reiterates the relevance of construction to economic growth. The report identified construction as a major contributor to the UK GDP (7.4% in 2011), adding that a £1 spent on construction output generates a

total of £2.84 in total economic activity, resulting in an increase in GDP. The UK construction industry, which comprises of about 350000 firms, employs over 3.1 million people, representing 10.5% of the UK employment, although the industry suffered the highest redundancy during the 2008- 2009 recession (UKCG, 2012).

The analysis above made efforts to show the importance of the construction industry and its relevance to economic growth. Countries that have experienced construction industry booms have benefited from such booms in terms of economic growth. A critical look into the Nigerian construction industry is imminent to discover if the same economic growth and citizenry satisfaction through infrastructure development is obtainable in the Nigerian context.

2.4 The Nigerian Construction Industry

Nigeria, which is the sixth largest crude oil exporter (OPEC, 2010), derives its boom in construction from its large oil exports. The Nigerian construction industry alone, accounts for 1.4% of its GDP (6.6% in 2011) (NPC, 2012). Oluwakiyesi (2011), reports that despite the growth seen in the Nigerian construction industry, its contribution to GDP has remained at abysmally low levels in the past three decades. This is as a result of the presence of barriers that hinder the progress and success of construction projects in Nigeria such as corruption, technical expertise and general laxity. Sanni and Windapo (2008), highlight that the Nigerian construction industry occupies a significant portion of the capital base of the Nigerian economy, adding that its success or failure has positive or negative impacts on the nation's economy. The industry basically consists of two main sectors, a formal or organized sector and an informal or unorganized sector. The organized sector is made up of organisations legally registered in the country, operating under set laws on employment, procurement and tendering while combining both highly skilled and expatriate labourers. On the other hand, the unorganized sector is made up of owner supervised construction of simple residential buildings and similar structures by private citizens carried out by gangs of artisans (Aniekwu, 1995).

Odediran *et al.,* (2012) elucidate that the Nigerian construction industry is still at an infancy stage of development, a state where the government is the major client to construction activities across the nation, with construction projects that provide basic amenities such as shelter, roads, water, electricity, etc. Odediran *et al.,* (2012) further decries the poor growth of indigenous construction firms in Nigeria, due to preference of international firms although this is responsible for the impressive growth of the Nigerian construction industry through enhanced government spending. Oluwakiyesi (2011) additionally highlights that over the last

three decades, Nigeria's total GDP has risen approximately 495 times, however, the construction industries' contribution to GDP has risen only 125 times. Oluwakiyesi (2011) posits that the construction industry in Nigeria is yet to realise its potentials, as the major drivers of the Nigerian economy which are Agriculture, Crude oil, Wholesale and retail trade, have been the same over the past three decades. Consequently, the declining nature of the Nigerian construction industry as experienced over the past three decades, despite the gigantic infrastructure the country possesses is expected to continue (Oluwakiyesi 2011; Odediran *et al.*,2012).

2.5 Challenges facing the Nigerian construction industry

There exist quite a number of challenges that have resulted in the declining nature of the Nigerian construction industry. This study however highlights the major challenges that hinder the effective execution of construction projects in the Nigerian construction industry.

2.5.1 Shortage of Technical Expertise:

The construction industry entails an agglomeration of different professionals such as Engineers, Quantity surveyors, Architects and Project managers. However, many of the big and successful construction firms in Nigeria, such as Julius Berger, amongst others, depend to a large extent on expatriates in these professional areas as there is a perceived gross incompetency in the local counterparts although a wrong perception (Odediran *et al.*, 2012). In addition, there exist very few project and finance institutions in the country with the required skill set to appropriately appraise and structure projects in Nigeria, hence the need to source for expatriate assistance (Odediran *et al.*, 2012).

2.5.2 Business environment- Regulatory and Policy

The nature of the Nigerian business environment in terms of regulations and policy making poses a great challenge to the success of the Nigerian construction industry. Three World Bank (2010) metrics on analysing the ease of doing business in a country which include "*dealing with construction permits",* "*enforcing contracts*", and "*protecting investors*" tell the story. According to the World Bank (2010), it takes approximately 350 days to deal with a construction permit in Nigeria, a figure that is higher than the sub- Saharan average of 268 days. Consequently, Nigeria ranks 167th out of 183 countries examined in dealing with construction permits and 97th in enforcing contracts. In addition, Oluwakiyesi (2011) reports that difficulties associated with land acquisition and laxity in contract enforcements are part of regulatory impediments affecting infrastructural development in the construction industry.

2.5.3 Misappropriation and poor policy implementation:

Corruption and poor project implementation have been identified as the central point of the challenges facing the Nigerian construction industry. Sanni and Windapo (2008) understudied contractors' quality control practices in Nigerian construction sites. They identified that the Government had a major role to play especially in Public Private Partnerships (PPP) by setting up modalities that would ensure transparency in the bid and tender process, the procurement specifications, and final selection of contractors. Oluwakiyesi (2011) further points out that the introduction of open public hearings for major construction jobs as well as the appointment of independent agencies to carry out appraisals, would go a long way in alleviating this challenge to the Nigerian construction industry.

2.6 Opportunities within the Nigerian Construction Industry

Notwithstanding the aforementioned challenges, improvements in the construction activities in Nigeria entail a number of benefits. Oluwakiyesi (2011) opine that construction projects aid economic developments as they provide jobs, enhance trade of materials and supplies as well as develop the technological capacity of the organisations involved in construction within the construction geographical location. According to Okoye *et.al.*, (2015), the contributions of construction to GDP, especially in developing economies such as Nigeria could increase by 10% annually if adequate attention and scrutiny are employed to construction activities. Similarly, the reliability of road construction projects, which is the expected life span prior to failure (Masrom *et al.,* 2013) can be optimised through improvements in the construction activities in Nigeria. Construction stakeholders are therefore endeared to develop strategies that identify critical areas where resources could be channelled to enhance the quality of constructed roads, benefit from its economic opportunities as well as improve on the nature of satisfaction recorded by its customers.

Owing to the fact that this research concerns Government construction projects, it is imminent to provide a conceptual definition for projects and identify what particular type of projects are of interest to this research.

2.7 Project definition:

Projects refer to individual or collaborative initiatives that are carefully planned to achieve specific aims and objectives (Whelton *et al.,* 2002). With the focus of establishing the characterization of construction projects, the PMBOK guide defines a project as "*a temporary endeavour undertaken to create a unique product or service*" (PMBOK 2003:11). Labuschagne and Brent (2005) see a project as any activity that has a defined beginning and

end and is carried out to achieve a particular purpose to specified quality standards within set out time constraints and cost limits. Also, Westland (2006:2) defines a project as "*a unique endeavour to produce a set of deliverables within clearly specified time, cost and quality constraints*". A key observation to the definition of projects is the uniqueness of the activity carried out and the corresponding recourse to time. Projects therefore on the basis of this research could be defined as any activity that involves the production of products, or offering of services with a unique nature, within the constraints of quality, time and cost.

Koster (2010), adopted and modified the definition of a project by Turner (1993: 8) to mean "*an endeavour in which human, material, and financial resources are organised in a novel way to undertake a unique scope of work of given specifications within constraints of cost and time so as to achieve beneficial change governed by quantitative and qualitative objectives"*. Indeed it can be inferred from the definitions of projects that the rationale behind carrying out projects is to achieve set out deliverables and/or objectives. However owing to the uniqueness of projects, it is expected that no two projects would have identical characteristics in the actual construction although technological advancements challenge this phenomenon (Koster, 2010).

Lock (2003) points out that the major characteristics of projects are its novelty, accompanied risk and uncertainties. He further iterates that no two projects are exactly alike even when the same projects are repeated. He traces the history of projects to the 'early age', the beginning of civilization, although argues that economic pressures of the industrialised world have greatly transformed the ideology behind projects. These ideologies were categorised as the growing defence and military needs, growing competition between firms as well as the greater regard for quality, value and wellbeing of individuals. These ideologies have collectively led to the development of new ideas and techniques for managing projects.

Another interesting characteristic of projects is its relation to change. Chapman and Ward (2003) identified that projects are different from the terminology 'Business as usual' because projects bring about change, often offer investment opportunities and are associated with several risks due to the uncertainties associated with such change. 'Business as usual' in this context involves activities with known processes and procedures (Chapman and Ward, 2003). Consequently, 'business as usual' is not accompanied by change and possesses a low risk level as they are often a repetition of an existing activity. Chapman and Ward (2003) further add that the changes involved in projects could vary from relatively small, to very large and appropriate levels of management would be required according to the change.

Projects in most instances are investment opportunities which utilise resources, and hence require funding. Therefore, they are expected to have measurable outcomes in terms of

quality, cost, delivery time, performance, as well as meeting up the needs of the end user, the consumer otherwise known as the customer. Koster (2010) however summarises the main characteristics of projects as

a) Limited, with a defined start to finish time
b) Unique and risky
c) Brings about change and investment opportunities
d) The value of the outcome of a project should justify the invested resources.

2.8 Types of projects

Literature offered by Chapman and Ward (2003); Lock (2003) and Koster (2010) suggest that projects are unique in their own respect. However the uniqueness of projects does not eliminate the fact that projects could be identical and possess similarities. Lock (2003) and Reynolds (2008) made efforts to categorise projects into four major groups considering the similarities in carrying out these projects. They include

1. Management projects.
2. Manufacturing projects
3. Research projects
4. Civil Engineering, Construction, Petrochemical, Mining and Quarrying projects

2.8.1 Management projects:

These types of projects involve more of a managerial approach in its delivery as it rarely results in a visible, tangible creation, but in the success of the desired outcome (Reynolds 2008). Similar to the definition of projects these management projects bring about desired change although they may not be identifiable as a physical hardware or a rigid construction. Examples of management projects include developing new computer software, company relocation to a new site, organisational restructure, production of a feasibility report, development of a new drug, amongst others (Lock, 2003; Reynolds, 2012). Subsequently, effective project management is required for these kinds of projects as required in the most complex construction project as there have been instances for example where software development problems had ripple effects on the overall project success and software maintainability (Chen and Huang, 2009).

2.8.2 Manufacturing projects:

These projects are often intended to produce a new piece of equipment or machinery either for a single customer or as new product for a company intended for subsequent manufacture and sales in large quantities. Reynolds (2008) identifies that ideally, manufacturing projects

are carried out in a factory or a home based environment with the holding company exercising spot-on management that provides optimum results. Common examples of manufacturing projects include new model for vehicles, aircraft safety ejection seat, plastic injection moulding and items consisting of specially designed hardware. However, Lock (2003) argues that ideal conditions do not always abide and some manufacturing projects may involve work away from the factory or home based environment such as equipment installation, commissioning and start-up, initial customer training as well as servicing and overall maintenance of equipment. He further adds that manufacturing projects may include complex operations such as in aircraft manufacture which is designed and developed by a constellation of companies and entertains difficulties in communication, coordination and control, international border differences involving legislation as well as contractual difficulties.

2.8.3 Research projects:

Research projects more often than not involve the application of in-depth knowledge on a particular issue or area to produce an entirely new product (Lock, 2003). These new products are unique in nature and may be modifications to an existing product or model. Just as required in any kind of project, research projects involve funding and accompanied risks and hence appropriate management has to be employed to ensure adequate value obtained from such funding.

2.8.4 Civil Engineering, Construction, Petrochemical, Mining and Quarrying projects:

Observed to be the initial picture that comes to mind when discussing projects in general, this category of projects is of paramount interest to this research. These projects are chiefly characterised by its location which is on a site usually distant from the contractor or client's main office. They involve the diverse building constructions of roads, bridges, houses, rail lines amongst others, erection of platforms for mining and drilling as well as mineral and material exploration through quarrying (Lock, 2003; Reynolds, 2008). In addition, this category of projects involves huge capital investments and thus deserves rigorous management of finance, time, progress, labour and quality. Reynolds (2003) however admits that most of these projects hardly get this rigorous management, leading to failure of such projects and customer dissatisfaction. He further notes that due to the magnitude of these kinds of projects, severe risks and complications abound as a result of the diverse specialists, suppliers, contractors and workforce that would be employed in the cause of this project, especially in large industrial projects.

Consequently, Lock (2003) identifies the primary project objectives for this category of projects, and they are summarised in two headings. He further adds that the project objectives can be applicable to other types of projects.

2.8.4.1 Specification, Performance and Quality (SPQ):

Projects must be designed, developed and executed to fit the purpose why they were initiated. In order words, the intention of a project must match the actual final project in terms of design, expected performance and quality of finished product. Initially, the qualities of products or projects were restricted to the quality control/ quality assurance department of firms. However in recent times, most firms and organisations have embraced Total Quality Management (TQM), a quality culture that embeds quality into all facets of the organisation as well as the design and work processes, thereby making the issue of quality a responsibility of the entire workforce, from top management to shop floor employees.

2.8.4.2 Budget:

Irrespective of the nature of the project embarked upon, all projects must operate within the confines of the authorised expenditure (although this is often always not the case). In projects where revenue generation and profits are the driving reasons behind such projects, overshooting the allocated project expenditure would lead to a decrease in profits as well as a decrease in the Return On Invested Capital (ROIC). However, in the absence of a profit motive in such a project, for example a charity organisation or a Government initiated project, issues of credibility and accountability ensure that the allocated budget is what should be expended in the actualisation of such a project.

Koster (2010) further summarises the characteristics of projects as being unique (in terms of defined objectives, organisation, and context), Risky (saddled with uncertainties and complexity), and Limited (in terms of duration, scope, financial resources and available human resources). Figure 2.1 shows the interacting nature of the characteristics of projects.

Figure 2.1: Interacting nature of the characteristics of projects

Source: Koster (2010).

2.9 Neo-classical approach to managing projects

According to Jaafari (2000), there has been an emerging need to change the approach to managing projects. The author identifies that the management of projects which was treated as a static activity, has experienced a massive drift and is now run as a dynamic system exposed to internal and external uncertainties and risks. Jaafari (2000) points out that most firms and organisations are still accustomed to the neo- classical or traditional approach to project management where projects go through a very long planning period and a complimenting phased approach to design, procurement and construction. He highlights the inefficiencies associated with this approach and opines that the solution lies in the redirection of the focus of firms and organisations on the creation of a viable business enterprise. This is evidenced in the renewed provision of an integrated solution where through the project life cycle, enhanced collaboration now exists between owners/ sponsors, consultants, customers, constructors, contractors, project marketing, business management and operational planning professionals. The reasons for the inefficiencies in the neo- classical project management are however stated below (Jaafari, 2000).

2.9.1 Prolonged project delivery:

Due to the prolonged planning process, there is always an accompanied delay in project delivery. Moreover, in the event of project delivery after such delays, the project fails to satisfy its set out objectives as a shift in the market need as well as the customer's quality expectation might have occurred.

2.9.2 Duplicate administrative resources:

Owing to the phased approach to design, procurement and construction, projects required separate administrative systems and resources. In addition, projects needed multiple data creation, interpretation and collation for each phase of the project, hence increasing the administrative activities involved with the project.

2.9.3 Unidentified total cost:

This was dominant in public construction and infrastructural development projects as the different phases of design, procurement and construction involved separate internal and phrasal expenditure. Improper accountability always led to projects exceeding set out budget and consequently affecting delivery times.

2.9.4 Errors and accountability issues:

The distribution of responsibility across the entire project life cycle in a phased approach always led to conflicting documentation as well as an undesirable accountability in the various processes such as design, procurement, construction, commissioning and handing over.

2.10 Modern approach to managing projects

Kerzner (2011) points out that project management has over the years evolved from a management philosophy which was restricted to a few functional areas, to an enterprise project management system that affects every aspect of an organisation. The concept of managing projects is now viewed as a business process rather than a mere management process. This business process involves methods of restructuring management and adapting special management techniques with the aim of obtaining better control and use of available resources (Kerzner 2011). Kerzner (2011) further adds that project management, which was initially confined to the U.S department of defence is now applied in diverse industries such as construction, pharmaceutical, chemical, banking, I.T, hospitals, law, government, amongst others. Meredith *et al.*, (2013), in addition, highlights three main reasons behind the evolution of a recent approach to managing projects and they include

2.10.1 The exponential expansion of human knowledge:

With an exponential increase in knowledge, the utilization of academic knowledge to solve problems associated with product development, production and distribution of goods and services becomes inevitable. This is evidenced in the diverse design software utilized in

product and service development made available through academic research, and the use of academic knowledge.

2.10.2 The growing demand for a broad range of complex, sophisticated, customized goods and services:

Organisations have now made product design an integral part of the production and distribution processes, tailoring product or service design to customers' needs.

2.10.3 The evolution of worldwide competitive markets for the production and consumption of goods and services:

This involves the introduction of cultural and environmental differences into managerial decisions relating to 'what', 'where', 'when', and 'how' a product or service is produced and distributed.

In conclusion, the PMBOK guide (4th Edition) cited in Kerzner (2011) and Meredith *et al.,* (2013) portrays the advantages of the modern approach to managing projects and they stated in the table below.

2.10.4 Advantages and Barriers of modern approach to managing projects

The table below is a summary of the advantages and barriers of modern approaches to project management.

Table 2.1: Advantages and Barriers of modern approaches to project management

Advantages	Barriers	Sources
• Identification of functional responsibilities to ensure that all activities are accounted for, regardless of personnel turnover	• Project complexity	Meredith *et al.,* (2013) Kerzner (2011).
• Minimizing the need for continuous reporting	• Customer's special requirements and change of scope	Meredith *et al.,* (2013)
• Identification of time limits for scheduling	• Organizational restructuring	Kerzner (2011).
• Identification of a methodology for trade- off analysis	• Associated project risk	Kerzner (2011).
• Measurement of accomplishment against plans	• Technological changes	Meredith *et al.,* (2013)
• Early identification of problems so	• Forward planning and	Meredith *et al.,*

that corrective action may follow • Improved estimating capability for future planning	pricing.	(2013) Kerzner (2011).
• Knowledge of when objectives cannot be met or will be exceeded.		Kerzner (2011).

This research however focusses on the non-classical or modern approach to the management of construction projects. This approach places emphasis on building a viable business enterprise through increased interrelationship between stakeholders and members of the project team throughout the project life cycle. The research also observes and identifies the antecedents of achieving customer satisfaction through the quality of government construction projects with an overview of the entire project life cycle.

2.11 Construction projects:

Furnished with the conceptual definitions of construction and projects, it is essential to define construction projects as a branch of production which involves the erection or reconstruction of structures and/or buildings for financial gains or infrastructural development (Koskela, 2000; Lock 2003; Koster 2010). These are carried out to achieve a particular purpose within specified limits of quality, cost and time. In addition, these types of projects are characterised by defined start and finish times with the ultimate aim of meeting the requirements of both the client and the consumer (Koskela, 2000; Torbett *et al.,* 2001; Whelton, Ballard and Tommelein 2002; Lock 2003; Koster, 2010). Importance is therefore attached to the two reasons behind construction projects which are financial gains and infrastructural development. These reasons have been observed to be potential determinants of the nature of the construction process and the quality of the constructed project. This research however is concerned with construction projects that are basically for infrastructural development where financial gains and profit are not driving forces in carrying out such projects.

In the UK for example, the Office of Government Commerce OGC, which is now part of the Efficiency and Reform Group (ERG) of the Cabinet office, was responsible for ensuring that the deliverables for public infrastructure development projects were achieved (ERG, 2014). The OGC was established to aid in delivering value for money from third party spend (taxes), supporting the delivery of Government policy goals as well as realizing project benefits through on time delivery, quality and cost boundaries. The OGC, through the Efficiency and Reform group of the Cabinet office also aimed at obtaining the best from the Government estate to satisfy the citizenry while delivering sustainable procurements on the Government

estate (OGC, 2010; ERG, 2014). Similarly, other countries such as America and Libya whose governments carry out massive construction jobs have de- centralized regulatory authorities to ensure value for public funds spent. Considering the American construction industry, Edwards (2013) highlights that investments in construction are driven by the private sector although accountability and de- politicking of government projects was essential to ensure value for money spent. Edwards (2013) categorically stated that quality management and user satisfaction were of top priority in the American construction industry, adding that there existed de-centralised procurement and monitoring agencies set up by the American government to ensure value for money spent on public construction projects. Similarly, considering the case study area Nigeria, the Bureau of Public Procurements (BPP) is responsible for ensuring quality, satisfaction and value for money spent on public projects. The BPP categorise public sector investments as Government construction projects which could either be physical infrastructure or strengthened institutional and human capacities. These projects are seen to lay foundations for national development (BPP 2008). The BPP adds that such construction projects are usually financed by the public (the customer), constructed by the Government either through contractors or in house personnel and made available for use by the public, although the projects are monitored by the Government.

Owing to the fact that these construction projects are financed by the customers (mostly through taxes and internal generated revenue) (BPP, 2008), there is dire need to ensure that the interest of the customer is protected throughout the entire life cycle of the construction project.

Labuschagne and Brent (2005) sought to provide ways of ensuring sustainable project cycle management in the manufacturing industry to promote stakeholder satisfaction. Observing that the manufacturing industry was more inclined to the production of products, Labuschagne and Brent (2005) identified that the existing project management frameworks did not effectively address the three goals of sustainable development, which included social equity, economic efficiency, and environmental performance. They further defined sustainable development in a business environment as a means of adopting business strategies and activities that meet the current needs of the stakeholders while protecting, sustaining and enhancing the human and natural resources. The adoption of these strategies was however lacking in manufacturing firms and needed urgent attention (Labuschagne and Brent, 2005). Consequently, research by PricewaterhouseCoopers and IWOe-HSG cited in Labuschagne and Brent (2005) highlighted that business oriented firms (such as manufacturing firms) were solely geared towards financial performance and areas of sustainability from the finished product are neglected. Hence, the need to review the current project management

methodologies that would ensure the incorporation and alignment of sustainability to the life cycle of projects in the manufacturing sector.

In the same vein, other industries such as health care and hospitality (Brynjolfsson and Hitt, 2000; Phaal *et al.*, (2004) have adopted operational procedures to optimize quality and ensure satisfaction while carrying out their projects or activities. These authors elucidate that the need to remain in business and ensure competitive advantage while enhancing the returns on invested capital (ROIC) was the driving force behind these industries. They attribute this need to be the reason behind the radical switch from the traditional administrative approach to managing projects to a strategic approach aided by the application of technology

This research is interested in optimizing the project quality of government road construction projects in Rivers state, Nigeria with a focus on the satisfaction made available to its customers or users. This is imminent as government construction projects are basically for infrastructural development, while alleviating the needs of its citizenry. The research adopts the same framework obtained in carrying out other projects, which follows a generic project life cycle but dissociates itself from the ideology of "ROIC" as the driving force behind the success of such projects. A synopsis of the processes involved with the execution of construction projects identifying the different associated phases is provided.

2.12 Project life cycle

2.12.1 Overview

All projects, irrespective of size, location, complexity and cost, usually conform to a generic life cycle. This cycle spans from the initial conception of the project idea, to the end of the useful life of the project. Although several authors such as Koskela, (2000); Lock (2003); Labuschagne and Brent (2005) argue that there is no ideal life cycle for projects owing to the uniqueness of each project, there seems to be a consensus in the life cycle of projects in the construction industry. Walker (2007) points out that the success or failure of construction projects lies in the effective management of the resources and processes associated with the project execution. Walker (2007), breaks down success in construction projects into fulfilled objectives of the construction firm and fulfilled objectives of the client, the owner of the project. Success in terms of fulfilling the objectives of the construction firm includes

- Increased productivity
- Improved service
- Obtaining loyalty from existing clients
- Attracting new business based on reputation

However, achieving success in terms of fulfilling the objectives of the client includes

- Functional and operational satisfaction
- Aesthetic satisfaction
- On time completion
- Completion within budget constraints
- Ensuring value for money (Walker, 2007).

Consequently, both objectives cannot be fulfilled without satisfying the customer who is also the end user of the construction project. Of greater concern in achieving these objectives is the delivery of public sector projects, such as Government induced construction projects which are mainly for infrastructural development. The pointers of achieving success in the constructing firm and fulfilling the clients' objectives revolve around the customer. For example, increased productivity stems from increased patronage and usage by the customer, improved service stems from feedback from existing service, while loyalty and attracting new businesses sprouts from the satisfaction experienced from the delivered construction project and subsequent recommendation.

Similarly, Yin and Chen (2010) who carried out a research on the life cycle of Government invested projects in China, identify that the Chinese Government, like any other construction driven economy, spends millions of Yuan in infrastructural development. They advocate for a raise in the efficiency of project management in these governments invested projects, as that would improve the good image of the Government, and increase confidence and reliability in its citizenry. Functional, operational and aesthetic satisfaction can therefore be obtained from meeting or exceeding the customers' quality expectations while on time completion within budget constraints will enhance confidence in the customers (who pay for and utilise the construction project). Ensuring value for money is the most sensitive objective to fulfil (Walker, 2007), as it summarises the cost- benefit analysis of a construction project where the benefits obtainable from such a construction project must outweigh the costs. Consequently, Westland (2006); Walker (2007); Yin and Chen (2010) identify the various phases associated with the generic project life cycle in construction projects and the literature obtained is geared at identifying areas that hinge on the customers quality expectations and the lapses in achieving customer satisfaction in the project life cycle.

2.12.2 Project phases

According to Westland (2006), the project life cycle consists basically of four phases which include the Initiation, Planning, Execution and Closure phases. Figure 2.2 shows the interaction and sequential order in which these phases operate.

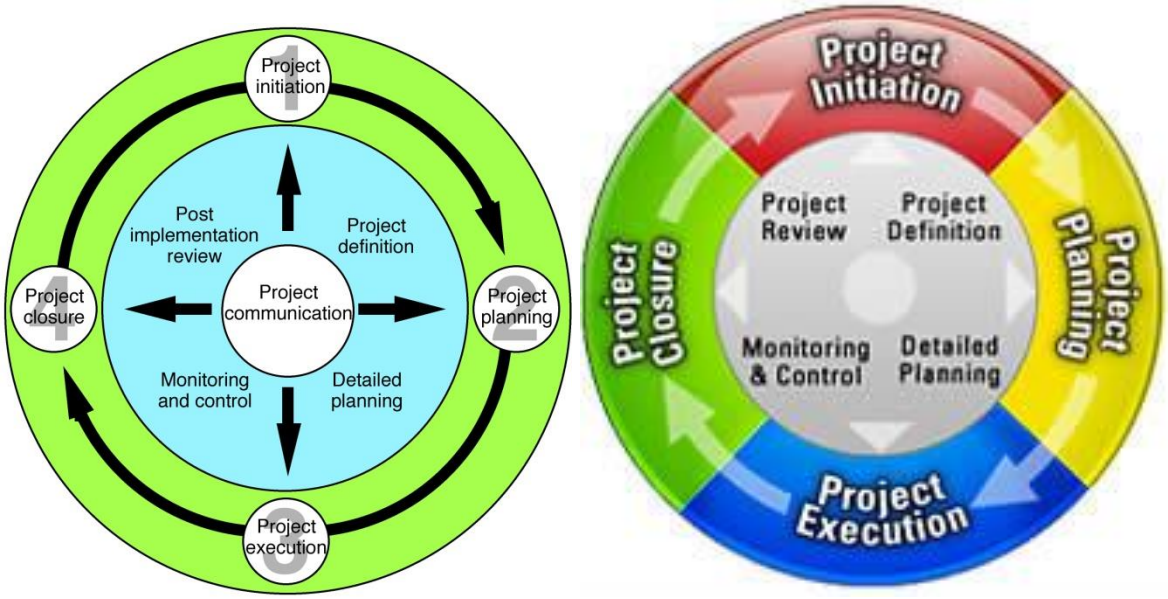


Figure 2.2: Typical Project life cycle
Source: Westland (2006).

2.12.3 Project Initiation Phase

The initiation phase (Appendix 1A) is the first phase in the project life cycle. This initiation is triggered by the identification of a business or research problem or the need to exploit an opportunity. In this phase, a business case is developed with an inclusion of possible options and solutions to address the business problem. A feasibility study is usually carried out in the initiation phase to access the viability of the problem solving options. According to Westland (2006:6), the purpose of a feasibility study is to *"assess the likelihood of each alternative solution option achieving the benefits outlined in the business case".* The author adds that the feasibility study also investigates if the predicted costs are reasonable, the preferred solution feasible, the associated risks acceptable, and the avoidance of identified issues within the construction project. From the feasibility study, a final solution is recommended based on thorough analysis from the study and terms of reference for the project are developed. These terms of reference include the objectives, the scope and the structure of the project in question. Westland (2006) further highlights that the terms of reference describe the vision, objectives, scope and deliverables for the project at hand, as well as the organizational structure, the required resources and capital required to successfully carry out the project. Sequel to the development of the terms of reference, an articulate project team is then appointed where the project manager is required to recruit people with relevant skills and experience and prepare a detailed job description for each role involved within the project. Although Walker (2007) argues that the client, due to its' influential nature is responsible for

setting out the management of the project, he attributes the success of any project to the effectiveness of the project team. The author in addition calls for early involvement of the project team in the project life ensuring the adequate utilization of their diverse skills, wealth of knowledge and experience. The initiation phase also includes setting up a project office. This office may either be a central project office, which serves as a rallying point for members of the project team, or a virtual project office where project team members are situated in diverse locations, connected by a defined means of communication (Westland, 2006). The project office should be set up to include computer equipment, stationery and materials, communication infrastructure, data storage and backup facilities, registers, as well as software and modelling applications.

At the conclusion of the initiation phase, a phase review is usually carried out which serves as a checkpoint to ensure that the set out objectives of the initiation stage have been achieved as planned (Westland, 2006).

2.12.4 Project planning phase

Often referred to as the detailed planning phase, the project planning phase as the name implies, encompasses all the necessary plans to achieve a successful project (Appendix 1B). This phase is of great importance as it ensures that the activities of the project execution phase are properly sequenced, allocated appropriate and adequate resources, and well controlled (Westland 2006). The first step in this phase is to develop a project plan.

2.12.4.1 Project plan:

In developing a project plan, a work breakdown structure (WBS) is designed and consists of a hierarchical arrangement of tasks broken down into work packages and activities to be carried out in the project. However, Jaafari (1998) and Jaafari and Manivong (1998) cited in Jaafari (2000) argue that the creation of a WBS is a traditional approach to project planning. They suggest that instead of splitting work down into work packages, the project is split up into parts, with each part made a responsibility of an integrated project team comprising of contractors, suppliers, designers, specialists, sub-contractors, as the case may be. They further point out that the WBS approach creates information barriers between parties involved in carrying out the tasks in the work packages adding that for effective project execution, there should be no communication barriers and information lags between parties involved in the project execution. However, the WBS approach is beneficial to construction projects as it breaks down massive tasks into workable pieces with the right information and communication provided from top to bottom management. At that low level of working with workable pieces, communication is not seen as a major issue as all the necessary information

has been passed and broken down accordingly with the WBS. Westland (2006) in conclusion on the project plan points out that the project plan is the key tool utilized by project managers to access project progress throughout the entire project life cycle. Sequel to the development of the project plan, the next step involves developing a resource plan.

2.12.4.2 Resource plan:

This consists of outlining the appropriate labour, the needed equipment, as well as material needed for each step of the project execution. According to Westland (2006), a detailed resource plan is necessary to identify the following;

a) The required resource for the particular project in terms of labour, equipment and materials.
b) The quantity of the required resource and make plans for procurement and inventory management.
c) Clear definition of the roles, skill set and responsibilities of the required human resources for the project.
d) Clear definition of the specifications on equipment and materials required.

Of great importance to the resource plan is the project environment and the level of skill required for the project execution. This should be evidenced in clarity of the labour recruitment policies and processes as well as the use of sustainable materials for the project environment.

2.12.4.3 Financial plan:

A financial plan is then developed to propose the total amount of money needed for each phase of the project. This financial plan entails the creation of an expense schedule (Westland 2006), which aids the project manager in comparing the forecast spend with the actual spend throughout the project. Yin and Chen (2010) further highlight the importance of a thorough financial plan, adding that projects are expected to be completed within the tolerance of the budget, and this can only be achieved through effective planning. However, Idoro (2010) argues that in the developing construction industries, for example the Nigerian construction industry, there is a perceived preferential selection of expatriate contractors over indigenous contractors in the award of contracts. Although, often stated in the resource plan, this preferential selection highly influences the financial plan of any project. Clients are however willing to spend more on these expatriate firms to achieve high quality and on time project delivery in comparison to working with local firms. Consequently, Idoro (2010) attributes this behaviour to the perceived low quality of materials often used by indigenous contractors

and the discrepancies in managing the allocated budget and available funds, all stemming from poor financial planning.

2.12.4.4 Quality plan:

ECI (1994 and 1996) cited in Idoro (2010) see the terminology quality as the actions, both planned and systematic which enhance the confidence that a particular product or service would fulfil its given requirements or specifications. The quality of a project is measured by its conformance to original design and its potential to offer satisfaction (Arditi and Lee (2004). Hence the need for a quality plan after creating a financial plan cannot be over emphasized as it remains a challenging procedure to meet or exceed customers' quality expectation. Westland (2006) summarises the contents of a quality plan in the project planning phase of the project life cycle and they include

a) A definition of the term 'quality' for the particular project. This could either be in the specification, the finishing, the final price, or the product or services' performance in comparison with competitors.
b) Clear and unequivocal quality targets required for each deliverable at each project phase, with each target aimed at meeting or exceeding one or more of the customers' quality expectations.
c) An assurance plan showing the strategy to ensure and verify that the defined quality targets are met.
d) A quality control plan containing the strategy to ensure uniformity and conformity to plan and specification while achieving the quality targets. This quality control plan will also include a medium to review the quality of the deliverables obtained from the project.
e) A summary of the various management processes such as time (operational and delivery), cost, risk, procurement, communication, amongst others.

The quality plan guides the nature of the input plan and the output product or service. However, for construction projects which are a hybrid of product and service, the quality plan guides and determines the nature of the finished project according to the clients' demands and customers' quality expectations.

2.12.4.5 Risk plan:

Also highlighted in the project planning phase, is the creation of a risk plan. This entails the identification and documentation of potential risks involved in the entire project, and possible actions to mitigate the effects of the risk occurring. Westland (2006) reiterates the importance of the risk plan stating that an effective risk plan aids in identifying and alleviating critical

project risks which could change the entire course of the project in good time before the execution stage. It should also be noted that the risk plan does not only cover the planning and execution stages of the project, but also highlights on potential risks after the project handover (Westland, 2006).

2.12.4.6 Acceptance plan:

An acceptance plan is seen as a means to assess if the project has been delivered successfully (Westland 2006). It entails the requirements needed by the customer to gain full acceptance of the product, a sign that all the deliverables offered from the project met or exceeded the customers' expectations. An acceptance plan is created to achieve clarity in accessing the level of acceptance of the deliverables within the project at hand. These could be obtained from reviews and feedback and they compare what was planned and what was actually delivered.

2.12.4.7 Procurement plan:

This is seen as the last planning activity in the project planning stage. The procurement plan highlights three major items which include

a) Goods and services to be acquired from suppliers
b) Justification for outsourcing against in- house sourcing
c) The project delivery schedule indicating relevant deadlines and milestones.

In addition, the procurement plan captures the tender process. This process states the selection criteria for a preferred supplier and also involves shortlisting preferred suppliers in order to commence contractual discussions. Lastly, a phase review is carried out to ensure that the objectives of the project planning phase have all been achieved before commencing with the project execution phase.

2.12.5 Project Execution Phase

In terms of duration, the project execution phase is probably the longest. This phase involves the physical construction of the deliverables in accordance to the customers' acceptance criteria. Appendix 2 illustrates the activities involved in the project execution phase of the project life cycle. Basically, the foundation of this phase is built around the three initial activities which are build deliverables, monitor and control, and perform stage- gate or phase review.

2.12.5.1 Build deliverables:

This activity involves the physical construction of each deliverable as required by the owner. Although the processes in this stage vary, Westland (2006) elucidates that the activities may

either be carried out in a 'waterfall' manner, where there is a sequential completion of deliverables until the production of the final deliverable, or 'iterative', where iterations are carried out until the deliverable conforms to the owners' specification.

2.12.5.2 Monitor and control:

In the course of the physical construction of the project deliverables, the presence of a careful monitoring and control process cannot be over emphasized. The management activities that need to be monitored in the project execution phase include; time management (Martin Skitmore and Thomas, 2003), cost and quality management (Arditi and Gunaydin, 1997; Martin Skitmore and Thomas, 2003; Hwang and Low, 2011), and change management (Gareis and Huemann, 2008; Hwang and Low, 2011). Other project management activities that need monitoring include Risk and issue management, Procurement management, acceptance management and communications management (Westland, 2006; Eriksson and Westerberg, 2011; Greenberg *et al.*, 2011).

2.12.5.3 Stage gate/ phase review:

This serves as a checkpoint to ensure that the project objectives have all been met. Westland (2006) elucidates that this review is carried out at the end of each phase in building deliverables, as well as monitoring and controlling the actualization of the deliverables.

2.12.6 Project closure

The stages involved with the project closure are illustrated in appendix 3. The project closure entails the handing over of the deliverables of the project to the customer. It consists of two major parts as shown in fig 1.6 which are 'perform project closure' and 'review project completion' (Westland, 2006).

2.12.6.1 Perform project closure:

This involves the following

- Finding out the accomplishment of the project completion criteria
- Highlighting outstanding activities
- Transfer of project documentation to the customer
- Termination of supplier contracts
- Communication of project closure to stakeholders.

2.12.6.2 Review project completion:

This action is viewed as the final activity in the project life cycle. It involves a review by an independent party on how well the project achieved the set out objectives in the planning phase. The review is aimed at ascertaining if

- The final deliverables justify the business case
- The deliverables meet the criteria specified in the quality criteria
- The deliverables were within the tolerance of the financial plan
- The project was delivered within the scope of the terms of reference.

2.13 Related project life cycles

The literature offered by Westland (2006) offered the characteristics of the project life cycle. Although as Lock (2003) initially highlighted the uniqueness of projects, most projects tend to follow this ideal life cycle outlined by Westland (2006). However, in the construction sector, there exists various other methods employed in offering deliverables and ensuring both client and customer satisfaction. These include the Royal Institute of British Architects (RIBA) plan of work (Appendix 4), the transportation infrastructure project life cycle, and the life cycle adopted for the Nigerian construction industry.

2.13.1 The RIBA plan of work

The RIBA plan of work which is predominantly used in the United Kingdom entails the designing, constructing and managing of building projects. The work plan also covers the administration of building contracts and simplifies the process of building construction projects into eight key work stages and 8 tasks represented on the task bar (RIBA, 2013). Appendix 4 gives a summary of the key stages in the RIBA plan of work in comparison to the ideal project life cycle. Indeed there exist similarities between the generic project life cycle and the RIBA plan of work. However, it is observed that quite a lot of resources are employed in the planning phases (design and pre-construction) and there is usually an in- use performance review on the project. These attributes are strategic to ensuring customer satisfaction throughout the life of the project.

2.13.2 Transportation construction project cycle

Al Nahyan *et.al.,* (2012), present the transportation construction project life cycle based on their research on the transportation infrastructure development in the United Arab Emirates (UAE). Al Nahyan *et.al.,* (2012), however, decry the complexities involved in managing infrastructure projects and attribute it to the seemingly large number of stakeholders involved in the construction of these projects. In understudying the transport infrastructure

development in the UAE, Al Nahyan *et al.,* (2012) developed a conceptual model for the management of transportation construction projects indicating the construction project stages, the stakeholder importance, the management issues involved as well as the project success indicators. Figure 2.3 shows the conceptual model

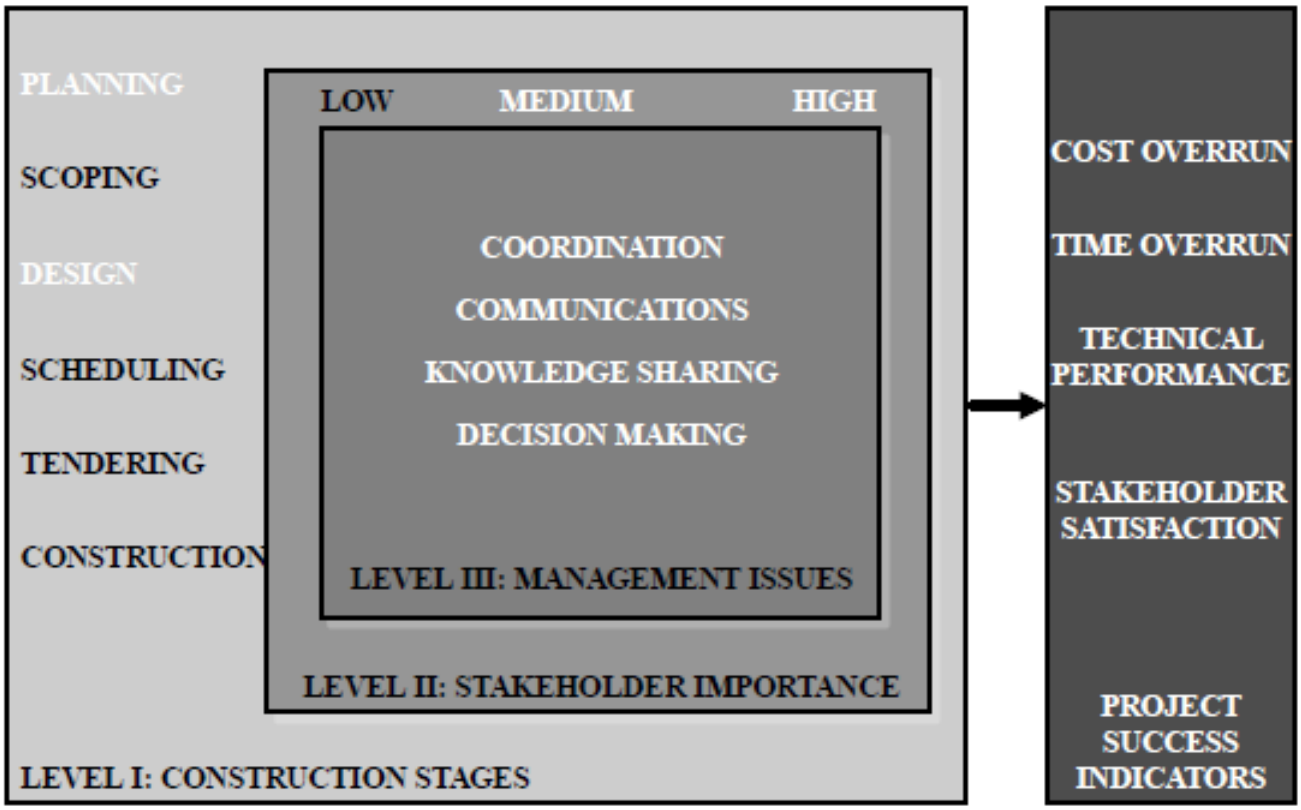


Figure 2.3: Conceptual model showing construction stages in a transportation construction project.

(Source: Al Nahyan *et.al.,(*2012).

Despite the resources put into the construction stages, otherwise known as the construction life cycle, Al Nahyan *et.al.,* (2012) identify coordination, communication, knowledge sharing and constructive decision making as the key managerial issues involved with transportation construction projects in the UAE.

2.13.3 The Nigerian Construction Project Life Cycle

Literature on Nigerian construction project management highlights similarities between the generic project life cycle (initiation, planning, execution and closure) and the life cycle adopted in the Nigerian construction industry (Oke and Ogunsemi, 2011; Olateju *et al.,* 2011; Igbokwe-Ibeto, 2012; Farinde and Sillars, 2012). According to Olateju *et al.,* (2011), the project life cycle demonstrates a logic that governs a project, thereby aiding in developing plans for carrying out such project. Whereas Igbokwe-Ibeto (2012) identifies six project phases, (conception, initiation, infancy, maturity, old age and death), the other authors

describe the Nigerian project life cycle under four major headings which are conceptualization, planning, execution and termination (Refer to Appendix 5).

Conceptualization involves development of the initial goal and technical specifications for the project. The available resources are identified alongside the required stakeholders. This stage however includes a feasibility study to determine if the project can be achieved or not. Planning on the other hand involves the development of detailed specifications, schematics and schedules. Work packages are broken down into smaller individual assignments with clarity on the antecedents for project completion. Establishment of a communication plan between the stakeholders is carried out in this planning phase as well as any other means of information transfer.

The project execution involves the actual physical work as outlined in the project plan. Effective monitoring is carried out here to ensure that the project remains within the plan and the set out objectives. Lastly, termination of project occurs when the finished project and its documentation is transferred to the customers. Termination however involves relieving resources, contractor and supplier contract termination as well as communication of project completion to stakeholders. The lessons learnt are also evaluated and input into plans for future projects.

In Nigeria however, the implementation of modern project management tools, methods and techniques are not fully established. This has resulted in the failure of construction firms and associated contractors by not meeting up with budget, technical specifications and project delivery deadlines (Olateju, Abdul-Azeez and Alamutu, 2011). Studies according to Idoro and Patunola-Ajayi, (2009) and Igbokwe-Ibeto (2012), have revealed that the social and political system, the cultural barriers as well as the low financial support in the Nigerian construction industry have been responsible for the poor performance of project management in Nigeria. Odediran *et al.,* (2012) who identify that the Nigerian construction market is among the largest in Africa opined that the nation is still far from realizing its potentials in the construction industry. All these buttress the need to improve the nature of construction projects in Nigeria, especially in the satisfaction obtained from carrying out construction projects. This research nevertheless focusses on improving customer satisfaction which is a part of project success, in Government construction projects. This is achieved through an investigation of the quality obtainable from the different processes in the project life cycle of construction projects in Nigeria. The research continues with an insight into the theories of satisfaction and customer satisfaction in the construction industry. This section however, concludes with a comparison between different life cycles (Table 2.2) of projects in other industries.

Table 2.2: Comparison between the various Project Life Cycles.

LIFE CYCLES PHARSES	BS 6079	IT PROJECTS	APM BOK	CIOB CODE OF PRACTICE	MOD	OGC	BPF	RIBA	NIGERIAN CONST. IND.
1	Concept	Feasibility	Pre-feasibility	Inception	Concept	Strategy assessment	Concept	Appraisal	Conceptualisation
2	Feasibility	Evaluation	Feasibility	Feasibility	Feasibility	Business justification	Preparation of the brief	Design brief	Planning
3	Evaluation	Function	Design	Strategy	Project definition	Procurement strategy	Design development	Concept	Execution
4	Authentication	Authorisation	Contract	Pre-construction	Design and development	Investment decision	Tender documentation and tendering	Design development	Termination
5	Implementation	Design& Build	Implementation	Construction	Production	Readiness for service	Construction	Technical design	
6	Completion	Implementation	Commissioning	Engineering services commissioning	In- service	Benefits evaluation		Production information	
7	Operation	Operation	Handover	Completion, handover, and occupation	Disposal	Disposal		Tender documentation	
8	Termination Constituents		Operation	Post completion in reviewed project, close out report.				Tender action	
9								Mobilization	
10								Construction to practical completion	
11								Post practical completion	

Source: Developed from (Lester, 2005; CIOB, 2010, Olateju *et al.*, 2011).

- The BS 6079 represents the British Standards institute (BSI) ideology on the project life cycle of an organisation's project. Implementation of the standard aims at achieving desired outcomes from projects, while obtaining the available learning that leads to continuous improvements.
- IT projects represent projects in the information technology industry.
- The Association for Project Management Body of Knowledge (APM BOK) presents the ideology of a project life cycle form a project management perspective.
- The Chartered institute of builders (CIOB) also presented their ideology on carrying out projects in the construction industry.
- MOD signifies the UK Ministry of defence and the cycle illustrated in Table 2.2 shows the various phases projects in the MOD pass through.
- The Office of Government Commerce (OGC), which is responsible for ensuring that the deliverables of public infrastructure development are achieved, propose their ideal project life cycle.
- BPF signifies the British property federation.
- RIBA signifies the Royal Institute of British Architects (see Appendix 4)

The definitions of construction projects, an insight into the various types of projects and the comparisons in the different project life cycles available have succeeded in shedding more light on the activities in construction projects. However comparing the existing project life of the Nigerian construction industry to other life cycles, it is asserted that the Nigerian life cycle lacks the capability to function effectively. Consequently, a more concise project life cycle is proposed for the Nigerian construction industry to include tender documentation and tendering, and post- handover. For this research, the project life cycle for the Nigerian construction industry would include; Conceptualisation, Project planning, Tender documentation and Tendering, Execution, Termination (handover), and Post- handover review.

2.14 Construction project quality and its management.

In order to establish the components of project quality, an insight into the characteristics of quality in construction is provided. Quality and quality management have been identified through research to be attributes of satisfaction (Torbica and Stroh, 2001; Palaneeswaran *et al.*, 2006; Nzekwe- Excell, 2010). Organisations and firms have constantly made efforts to modify, develop and implement several quality enhancement techniques to improve

production processes and maintain competitive advantage. This section offers a working definition of quality in the context of this research as well as identifies its relevance to the success of Government construction projects. The section further highlights quality management practices that influence project quality and project success in carrying out GCP's.

2.14.1 Quality Overview:

The concept of quality and its management has in recent times gained popularity amongst firms producing products and offering services (Kandampully, 1998). Despite organizational philosophies, the concept of quality poses a great challenge on the survival and growth of businesses, especially where the need to attract more, and retain existing customers is imminent (Agyapong, 2011). The issue of quality is one that has constantly raised arguments, first on its definition, and secondly on its implementation (Palaneeswaran *et al.*, 2006). While one category sees quality as a way of carrying out activities to required standards and eliminating waste, the other sees quality as a characteristic of a product or service that guarantees its acceptance over competitors (Weihrich, 1994).The term quality is often viewed as an elusive construct which is mistaken for imprecise adjectives like goodness, luxury, lustre, glitter, physical strength, and even expensive cost (Crosby, 1979; Palaneeswaran *et al.*, 2006). Among the earliest to research on quality earning the status of 'quality gurus' were, Dr. W Edward Deming, Joseph M. Juran and Phil B. Crosby (Crosby 1990, Miller 1996). Dr. Deming was famous for his novel introduction of a comprehensive management system which forms the basis of the modern quality management approach known as Total Quality Management (TQM). According to Pindur *et al.*, (1995) and Sun (2000), TQM involves the utilisation of a statistical approach to analyse variability in production processes in order to continuously improve the product quality.

Juran obtained his quality guru status basically through his publication of the quality control handbook in 1951, championing the improvement of quality through management (Palaneeswaran *et al.*, 2006). Juran (1951) through his research argued that quality improvements were obtainable from the management processes with directions coming from top management. He developed the 'Juran Trilogy', which identifies three basic quality related procedures that influence product quality, known as quality planning, quality control and quality improvements. Crosby on the other hand, obtained his guru status by identifying that the attributes of quality must be measurable, and must conform to predetermined specifications (Reed, Lemak and Mero 2000). Table 2.3 shows the relationship between the ideologies of the three gurus on quality.

Table 2.3: Comparison of philosophies on quality.

Aspect	***Perspective of***		
	W. Deming	***J.M Juran***	***P. Crosby***
Quality Management Orientation	*Technical*	*Process*	*Motivational*
Quality definition	*Non- faulty systems*	*Fitness for use*	*Conformance to requirements*
Responsibility	*Management*	*Management*	*Management*
Goal	*Meet/exceed customer needs*	*Continuous improvements*	*Zero defects*
Implementation element	*14- Point program: TQM*	*Juran Trilogy: quality planning, quality control and quality improvements*	*14-Step program*

Source: Reed, Lemak and Mero (2000).

A comparison of the works of Deming, Juran and Crosby, (Crosby 1979, 1996; Deming 1982, 1986; Feigenbaum 1951, 1961, 1983, 1991; Ishikawa 1985; and Juran 1951, 1962, 1974, 1988, 1989, 1992) cited in Reed, Lemak and Mero (2000) revealed that all the authors accentuate that the customer defines quality, and that quality creates customer satisfaction as well as improved competitive advantage. Their comparisons also identified that the three gurus also agreed on the fact that high productions costs were associated with waste and rework and called for its elimination through improved quality. The terminology quality, despite its ambiguity is defined carefully through a combination of the definitions offered by scholars in the quality management field.

2.14.2 Definitions of quality

ECI (1994 and 1996) cited in Idoro (2010) describes the terminology quality as *"all the planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality"*. Also, Arditi and Lee (2004), point out that the quality of a project is measured by its conformance to a quality plan originally designed to enhance customer satisfaction. Most recently, the delivery of quality in product and service organisations has become top priority for its management. Authors such as Zeithaml *et al*, (1988), Berry *et al.*, (2001), Nzekwe- Excell (2010) avow that quality can be summarized as the customer's perception of that delivery (product or service) which surpasses expectations. This perception is a critical prerequisite and determinant of competitiveness through which customer relationship is established and sustained. The issue of quality cannot be discussed without credence to the school of thought hinged on the

Japanese philosophy and proposed by Crosby (1979) which states that quality is "zero defects". Crosby (1985) further likened quality to signify conformance to specification, as well as the act of "Doing It Right First Time" (DIRFT). In addition, Berry *et al.*, (2001) sees quality as fitness for use, conformance to requirements, and freedom from variation. The American Society for Quality Controls defined quality as the totality of features and characteristics of a product or service that hinge on its ability to satisfy stated or implied needs. According to Berry *et al.*, (2001) quality design and management is not the responsibility of just one department or individual rather it is an organizational wide activity which involves all members of the organisation. Quality on its own, does not portray a level of acceptability by all that encounters it, however, it reflects the extent to which an individual stays satisfied with the number of satisfaction criteria. Anyanwu and Nwokah (2008) defined quality as the standard of something when compared to other things like it. Presumably, it is a standard in the production of goods or services which bear on its features a level of acceptable performance. In view of the diverse ideologies on quality, quality in the context of this research is defined as the positive worth of a product or service in relation to its conformance to requirements, its suitability for use, and its potential for ensuring satisfaction (Palaaneeswaran, 2006 and Nzekwe-Excell, 2012).

In a project environment, the requirements of quality are not any different from the definitions stated above. Projects, especially construction projects need to be handled in such a manner that they conform to requirements, fulfil the intended need and ensure satisfaction, both from its clients and users. It should be noted here that the client in most construction projects may not necessarily be the user or customer of such project. Considering road construction projects, which is the focus of this research, there exist a number of attributes which summarise the project quality.

2.15 Project quality in construction

In considering the quality of a project in a construction environment, two dissimilar requirements are highlighted by Torbica and Stroh (1999) and Nzekwe- Excell (2010). These include quality as a conformance to set out requirements, and quality as a pre requisite for customer satisfaction. In other words, to achieve project quality, there has to be a synergy between conformance to the benchmarked specifications, and meeting the requirements of the customer to ensure satisfaction. The benchmarked specifications are usually set out by the designer, architect, contractor, or a specialist in the project team, and achieving this sets the pace for customer satisfaction. Hence project quality is quite essential to this research as it highlights two key areas of interest in carrying b out GCP's which are conformance to

requirements and customer satisfaction. However, Maloney (2002), elucidates that there has to be a clear and succint understanding of the required specifications when considering quality matters. Even though his focus was on service quality, it is assumed here, that the same applies for project quality as both service and project quality are aimed at improving customer satisfaction.

2.16 Measurement of project quality

In order to successfully measure project quality, Rad and Khosrowshahi (1998) opine that three interdependent but discrete components must be integrated. They include;

a. **Strategy and structure:** This is entails the constituents of the project, what it actually is and how it functions.

b. **The technical component**: this relates to project organisation skills, practices, tools and methods used throughout the project organisation for the product and process development.

c. **Culture**: this includes the norms and behavioural exceptions the project organisation has set for itself and the people involved in the organisation.

Although the subjective nature of quality makes it difficult to physically measure, an integration of these three components yields a significant and observable measure for quality. Additionally, the attributes of project quality can also be employed when the need to measure quality arises (Wang and Ji, 2010). These attributes can either be ranked or scaled and subjected to either statistical analysis.

2.17 Attributes of project quality

In order to address the issue of project quality in government road construction projects, the attributes of project quality need to be discussed. This research adopts the structure illustrated by Tam, (2004), Takim and Adnan (2008) and Jakpar *et al.,* (2012) combining both the service and product components of construction projects. This structure identifies project cost, project delivery time, project performance, project aesthetics, project reliability and project usability as the key attributes that define a construction projects' quality and consequently provides satisfaction.

2.17.1 Project cost:

The PMBOK (2010) identifies the cost in a construction environment as the sum of the initial capital and subsequent operation and maintenance costs. In a construction project, the capital cost may include expenses incurred in the initial establishment of the project which includes land/ site acquisition, planning and feasibility studies, architectural, and Engineering designs,

construction materials, equipment and labour, site supervision, insurance and taxes, office equipment and furnishing as well as legal fees associated with the contract to construct (Akintoye, 2000). On the other hand, operation and maintenance costs are incurred during the life cycle of the construction project and may include wages of operating staff, maintenance and repairs, logistics, utilities and miscellaneous expenses. Agreeably, the magnitude of these costs depends on the size and nature of the construction project, and Zu *et al.,* (2008) points out that project owners' usually strive to achieve the lowest overall project cost without compromising the project objectives. The project cost is therefore vital in ensuring overall project quality as there is often a dilemma in compromising the project objectives to reduce project cost, thereby compromising the overall project quality. A thorough understanding of costs and its influence on project quality is therefore imminent. Issues such as cost estimation, methods of allocating joint costs, historical cost data analysis, cost indices and its application to estimation, computer aided estimation as well as the estimation of operating costs need to be understudied prior to actual construction as this would reduce the compromise of cost to project quality.

2.17.2 Project delivery time:

Project delivery time and its management has been identified as a key barrier to optimising project quality and consequently satisfaction in the construction industry (Walker and Shen, 2002; Obunwo *et al.,* 2013). In their study on Construction Time Performance CTP, Walker and Shen (2002) were able to determine the rate of build. Also known as a method of predicting time performance, they compared how long a project should take with the actual time of construct, thereby establishing how well the project faired with respect to planned and actual time. Construction project delays due to time overruns have consequently had adverse effects on the quality of the finished project as well as the level of satisfaction obtained from such project (Aibinu and Jagboro, 2002). Aibinu and Jagboro (2002) further highlighted inefficient materials handling, low cash flow and hurried construction amongst others as issues that influence the project delivery time.

2.17.3 Project performance:

Performance generally refers to the way in which someone or something functions. From a construction perspective, performance refers to the manner in which or the efficiency with which a constructed project reacts or fulfils its intended purpose (Oluwakiyesi, 2011; Olatunji and Diugwu, 2013). Project performance however entails the activities that ensure that the project fulfils this intended purpose and satisfies the expected need. Atkinson *et al*., (1997)

and Love (2002) elucidate that successful construction project performance is achieved when the requirements of stakeholders are met individually and collectively. The measurement of performance therefore gives an indication of the success or failure of a project, although the identification of performance indicators, performance measures and the actual performance measurement are actually an arduous task (Beatham *et al.,* 2004)

According to Mbugua *et al.*, (1999), performance indicators entail the measurable indications that prove that a planned effort has achieved the anticipated result. In a situation where these indicators can be measured without ambiguity but with a high degree of precision, they could be referred to as performance measures. Although in an ideal situation, it is quite impossible to obtain an accurate measure, hence performance indicators are utilised to collate performance and these could either be numerical or quantitative data. The knowledge and measurement of project performance aids in evaluating construction activities and further enhances continuous improvements (Sinclair and Zairi, 1995; Mbugua *et al.,* 1999). Cox *et al.,* (2003) observe that Key Performance Indices (KPI) play a vital role in providing information on the performance of construction tasks, projects and companies. Similarly, Beatham *et al.,* (2004) opine that KPI's give a wider perspective on achieving project success. Beatham *et al.,* (2004) highlight that project success is usually measured by the degree to which the project objectives have been met which could be expressed in terms of time, cost and quality. Consequently Chan and Chan (2004) identify items such as quality, functionality, the end-user's satisfaction, the client's satisfaction, the design team's satisfaction, and the construction team's satisfaction as subjective measures as well as objective measures such as construction time, unit costs, and net present value. Table 2.4 provides a summary of performance indicators involved with construction projects.

Table 2.4: Summary of available previous studies on performance indicators at project level.

No	Author and year	Country	Performance indicators
1	Jastaniah (1997)	Saudi Arabia	1Client satisfaction 2. Planning period 3. Staff experience 4. Communication 5. Safety 6. Closeness to budget 7. Profitability 8. Payment 9. Claims
2	Egan (1998)	UK	1. Predictability – time, cost 2. Construction cost 3. Construction time 4. Productivity 5. Profitability 6. Safety 7. Defects 8. Client satisfaction
3	Department of the Environment, Transport, and the Regions (DETR), 2000	UK	1. Time 2. Cost 3. Quality 4. Client satisfaction 5. Client changes 6. Business performance 7. Health and safety
4	Pillai *et al*. (2002)	India	1. Benefit 2. Risk 3. Project status 4. Decision effectiveness 5. Production 6. Cost effectiveness 7. Customer commitment 8. Stakeholders 9. Project management
5	Cheung *et al.*, (2004)	China	1. People 2. Cost 3. Time 4. Quality 5. Safety 6. Client satisfaction 7. Communication 8. Environment
6	Wong (2004)	UK	1. Staff experience 2. Resources 3. Site management 4. Safety 5. Contractor experience 6. Time 7. Cost 8. Quality
7	Constructing Excellence (2005, 2006, 2009) and Roberts and Latorre (2009)	UK	1. Client Satisfaction 2. Defects 3. Predictability cost, time 4. Construction cost, time 5. Variance cost, time 6. Contractor satisfaction 7. Profitability 8. Productivity 9. Safety 10. Social indicators 11. Environment
8	Rankin et al. (2008) and Canadian Construction Innovation Council (CCIC) (2007)	Canada	1. Cost 2. Time 3. Quality 4. Safety 5. Scope 6. Innovation 7. Sustainability 8. Client Satisfaction
9	Luu *et al.*, (2008)	Vietnam	1. Construction cost 2. Construction time 3. Customer satisfaction 4. Quality management 5. Team performance 6. Change management 7. Material management 8. Safety
10	Skibniewski and Ghosh (2009)	USA	1. Construction cost 2. Construction time 3. Predictability cost and time 4. Defects 5. Client satisfaction product
11	Toor and Ogunlana (2010)	Thailand	1. On time 2. Under budget 3. Specifications 4. Efficiently 5. Effectiveness 6. Safety 7. Defects 8. Stakeholders 9. Disputes
12	Construction Industry Institute (CII) (2011)	USA	1. Cost 4. Accident 2. Schedule 5. Rework 3. Changes 6. Productivity

Adopted from Ali, Al-Sulaihi and Al-Gahtani (2013)

A direct mapping of the performance indicators revealed that areas such as client satisfaction, time and cost requirements, health and safety as well as the profitability within projects have attracted enormous research attention. However, issues bothering on claims or in some instances compensation, customer satisfaction, reliability of projects as well as the aesthetics

involved within projects were found to be trailing in research attention. Table 2.5 shows the mapping of project performance indicators and their occurrence in construction project related research.

Table 2.5: Frequency of performance indicators in construction literature.

Performance indicators	Occurrence in construction literature															
Client satisfaction	√	√	√	√	√	√	√	√								
Planning	√	√	√	√	√	√										
Experience	√	√	√													
Communication	√	√	√													
Safety	√	√	√	√	√	√	√									
Budget	√	√	√													
Profitability	√	√	√	√	√	√	√									
Claims	√															
Time	√	√	√	√	√	√	√	√								
Aesthetics	√															
Cost	√	√	√	√	√	√	√	√	√	√						
Defects	√	√	√													
Teamwork	√	√	√													
Quality management	√	√	√	√												
Project management	√	√	√													
Risks	√	√	√													
Customer satisfaction	√	√														
Reliability	√															

Adopted from Ali, Al-Sulaihi and Al-Gahtani (2013)

Consequently, these areas with low research attention are of interest to this research and in addition to time, cost and performance, characterise project quality in construction. The research further aims at establishing if government road construction projects fulfil their intended purpose, ensure the satisfaction of its users, and enhance rep- patronage and referral of the contractors.

2.17.4 Project reliability

In any construction endeavour, the reliability of the project is very essential as its presence is seen as a strong determinant of satisfaction from such construction project. Reliability is defined as the probability that an item would perform its required function without failure

within the constraints of set out conditions and time (Oluwakiyesi, 2011; Olatunji and Diugwu, 2013). The term reliability can also be seen as the specified timeframe a system consistently performs its intended function without degradation or failure under specified environmental conditions. Statistically, reliability is expressed as the mean time between failures MTBF (Jonsson and Svingby, 2007). Although Oluwakiyesi (2011) and Olatunji and Diugwu (2013) agree that structures and in this case construction projects may fail at any time, the nature of the design, its construction and mode of operation usually determine how reliable such a project would be. Despite the advancements in construction management, authors such as Gwilliam *et al.,* (2009), Oluwakiyesi (2011) and Olatunji and Diugwu (2013) opine that the quality and reliability of construction projects are becoming more significant and these are seen as motivating factors to either engage or withdraw from construction. The reliability of road construction projects in Nigeria, especially within the Port Harcourt metropolis of Rivers State is perceived to be at abysmally low levels. Olatunji and Diugwu (2013) highlight the efforts made by the Federal Government of Nigeria as an intervention to the nature and reliability of Nigerian roads. These include the establishment of the Petroleum Trust Fund (PTF) between 1996 and 1998, the launching of the 'Operation 500 roads' aimed at upgrading 500 roads across the country in year 2000, and the establishment of the Federal Road Maintenance Agency (FERMA) in 2003 to attend to the efficiency and effectiveness issues observed within Nigerian roads. According to Olatunji and Diugwu (2013) despite these interventions, road networks within Nigeria are still in deplorable conditions, with only a little percentage adjudged to be in good condition. With the inclusion of poor funding, the questions on the reliability of government road construction projects are chiefly hinged on inconsistencies in government policies, inadequate procurement practices, poor construction management practices as well as corruption (Nworji and Oluwalaiye, 2012; Olatunji and Diugwu, 2013). Furthermore, with the failures experienced in Nigerian roads, there are accompanied man hours loses annually in traffic as well as huge losses between ₦133.8 billion and ₦175 billion Naira (£ 5 to £ 7 billion Pounds) due to increased vehicle operating costs, delayed turn-around, increased travel time, as well as reduction in asset value (Nworji and Oluwalaiye, 2012). Olatunji and Diugwu (2013) also point out that the deplorable state of Nigerian roads are also responsible for 80% of injuries and deaths from traffic related accidents, thereby having an overall impact on the National productivity as the country loses over N450 billion Naira annually (£15 billion Pounds) due to the unreliability of road transportation. These inefficiencies in carrying out government road construction projects have informed practitioners and researchers to explore other forms of carrying out

construction activities within the region such as Private Public Partnerships PPP and hence possible ways of improving the reliability of government road construction projects in Nigeria (Akintoye *et al.*, 2003; Olatunji and Diugwu, 2013).

2.17.5 Project Aesthetics

Project aesthetics is viewed as a vital attribute of project quality as it entails the physical and visible aspect of the constructed project (Pheng and Chuan, 2006). According to Love and Irani (2003), the aesthetic component of a construction project is an indication of the operational ability of a project, adding that alterations in the construction process can hugely affect the aesthetics of such project. Aesthetics are also seen as a function of the quality of design employed in a construction project (Pheng and Chuan, 2006). Considering road projects, the design although aimed at providing structural rigidity, is also expected to include artistic and appealing components as these are what would be visible to both the client and the customer.

Whereas issues bothering on project cost (Akitoye, 2000; Shane *et al.*, 2009) and project delivery time (Walker and Shen, 2002; Aibinu and Jagboro 2002) have been researched on, three attributes of project quality will be considered in the course of the research. They include project performance, project reliability and project aesthetics. These attributes encompass the conditions required to fulfil the design requirements and offer satisfaction. These three are selected not only because they have not been researched exhaustively, but considering road construction projects, they characterise areas for obtaining satisfaction and this is of paramount interest to the research.

With the identification of project cost, project delivery time, project performance, project delivery and project aesthetics as the key constructs of project quality, there exists the need to specify the method of selection of the attributes of project quality. For purposes of this research, the selected variables of project quality have been arrived at through categorisation. Categorisation is defined as a process whereby ideas and or constituents are identified, differentiated, classified and understudied for a specific purpose. Considering research, categorisation entails grouping items based on their similarities, differences or even relevance to research. Other methods of grouping variables can be obtained by Exploratory Factor Analysis EFA, Principal Component Analysis PCA, and Confirmatory Factor Analysis. Whereas both EFA and CFA are examples of factor analysis which employs statistical methods to simplify patterns of relationships between measured variables, PCA is employed when the need is to reduce the number of variables while retaining a greater percentage of the

original variance in the data set (Ruscio and Roche, 2012). EFA can be employed to data when the need is to identify the common factors that influence measures while testing their strengths and relationships. CFA on the other hand can be used when to know if a model can predict a set of observed data, while PCA could be used when the need was to reduce the number of variables based on their possession of similar characteristics. However, these were not the situation in this research as the research sought to identify areas that needed closer attention, as well as areas of project quality that had been under researched but had the potential to enhance customer satisfaction. Hence the adoption of the use of categorisation, rather than EFA, CFA or even PCA.

2.18 Chapter summary on Construction Project Quality

This chapter has succeeded in offering working definitions for construction projects and quality management in a construction environment. The revelation of quality as the fulfilment of requirements while possessing the potential to ensure satisfaction created a pathway for defining the attributes of project quality in road construction. Furthermore, adopting a life cycle for the Nigerian construction industry as well as selecting aspects of project quality that hinge on customer satisfaction is only but a process of expanding on the conceptual framework for this research. In continuation, and in order to establish relationships between project quality and customer satisfaction, a synopsis on customer satisfaction in the construction industry, the various models and attributes of satisfaction in a construction environment will be discussed.

3. Chapter 3: CUSTOMER SATISFACTION IN CONSTRUCTION

3.1 Introduction:

The previous section identified the conceptual definitions of projects in general and construction projects with an insight into the different phases involved in construction projects. That section also identified key areas of project quality that define satisfaction from construction projects. This section sheds more light on the personality of the customer especially when considering construction projects. The chapter contains an analysis of various customer satisfaction models identifying the lapses in its implementation in government infrastructural development projects.

Recently, there has been an increase in the need for firms to produce high quality products and / or provide high quality services to retain competitive advantage (Maloney, 2002; Karna, 2004; Ngacho and Das, 2015). Construction firms have continuously redesigned, modified and developed their project management operations to deliver projects that are fit for purpose and satisfy all concerned stakeholders. In Yang and Peng (2008), it was identified that a measure of the customer satisfaction of products and services gives an indication of the level of quality found in such products and services. Yang and Peng (2008) further recognized that the concept of customer satisfaction transforms all industries, firms and organisations from production centralised to customer based. Whereas Maloney (2002) views construction projects as a hybrid of product and service components, such projects could refer to actions that results in products and the offering of services as well. In order to distinctively discuss the terminology customer satisfaction, it is obligatory to provide concrete definitions of customer and customer satisfaction as the research would be guided by these definitions.

3.2 The customer

Torbica and Stroh (2000: 35) gave two simple definitions of a customer as, “one who pays the bills” and “one who uses a product or service”. Hence there exist basically two types of customers; a “paying” customer and a “user” customer. From a construction point of view, the paying customer is also referred to as the owner or client, as most construction projects have been designed and built for a client instead of the potential users, although such client may not be a user of the construction project. Torbica and Stroh (2000) however identified that in construction projects there exists a common practice in the flow of responsibility

where the designer and contractor, paid by one client, design and build a structure for another, the user. Therefore both the client who pays for such project and the user of the product from the construction project is termed as the customer in this respect.

Maloney (2002) agrees with this ideology and points out that a client in need of a particular service employs the service of contractors and hence stresses the need for the satisfaction of both the client who pays for the service, and the users of the service. Karna (2004: 69) on the other hand defined a customer as *"the owner of the project and the one that needs the constructed facility".* Better put, the customer is the one who purchases a product or service. A customer may also be viewed as a body that incorporates the interests of the buyer of construction services, prospective users and other interest groups. However, the decisions in buying the construction services involve several persons engaged with the procurement service. This makes up the 'buying center' and consists of the decider, the influencer, the purchaser, gatekeeper and the user (Brockmann, 2002). The roles played by the individual members of the buying centre in terms of interests, goals decision process and structures has direct impacts on customer satisfaction which is discussed subsequently. Dikmen *et al.*, (2004) further posit that in a construction environment, depending on the type of project, the customer is interchangeably referred to as the end user or the client. However in the course of this research, the definition of the customer will be limited to the end user and citizenry who latently pay for the infrastructural development projects through taxes and internally generated revenue. Considering GCP's there exists a customer loop between the Government, the contractors and the users of the constructed project (Figure 3.1). A conflict of definition is observed as the end users pay the government and by definition become the customers. However, the government pays contractors to carry out the construction projects and in turn become customers to the contractors. In order to ensure clarity in the course of this research, the Government sector will be referred to as the 'Client', while the terms customers' and end users or even citizenry would be used interchangeably to refer to those whom the construction project is constructed for.

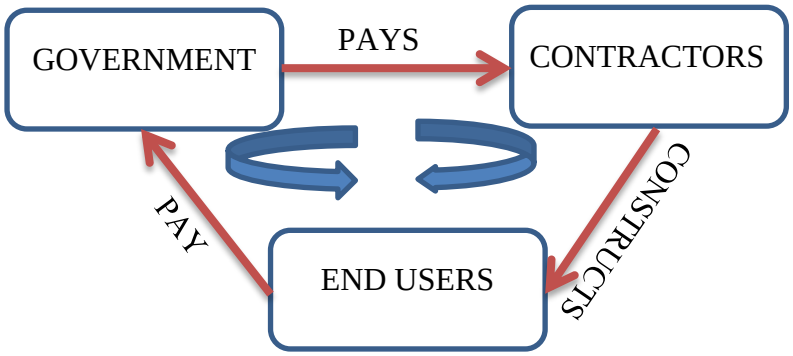


Figure 3.1: Customer loop in Government construction projects

Source: Author.

3.3 Satisfaction Theories:

According to Tse and Wilton (1988) cited in Yang and Zhu (2006), satisfaction is viewed as a *"psychological phenomenon describing the emotional state resulting from an evaluation of the perceived discrepancy between prior expectations and the actual performance of the product".* Several researchers such as Cardozo 1965; Yang and Zhu 2006; Fuller and Matzler 2008, have highlighted theories used to explain this psychological phenomenon as well as identifying the antecedents of achieving satisfaction. Although these theories are centred on the customer but are not exclusively directed at the construction industry, the ideologies entailed are of relevance to the industry. In practice, theories are employed to explain satisfaction in individual contexts and these theories are highlighted below.

3.3.1 Cardozo Satisfaction theory:

Cardozo (1965) carried out the first experimental study on satisfaction with reference to the customer. His proposed theory suggested that two items, customer effort and customer expectation for a product, have significant impacts on and can be used to explain and evaluate satisfaction. Defining customer effort as the physical, mental and financial inputs of a customer before purchase, Cardozo explains that satisfaction is initiated by these inputs or behaviour's that consequently lead to purchase. On the other hand, customer expectations relate to what customers do to become satisfied and this is greatly influenced by the nature of information available to the customer. Cardozo however adopted the contrast theory and the dissonance theory in his study to explain the relationship between effort, expectation and satisfaction and the results obtained are summarized as follows.

- The application of more effort results in a favourable product evaluation.
- Product evaluation is achievable based on having knowledge of the customer's expectations.
- Effective marketing of a product can greatly influence customer expectations.

In conclusion, Cardozo pointed out that the evaluation of satisfaction was obtainable from diverse parameters, and should not be restricted to both product evaluation and purchase experience.

3.3.2 Effort- Satisfaction theory:

This theory of satisfaction holds that a relationship exists between the effort expended by a customer in purchasing a product and the experienced satisfaction from the use of such product. Championed by Hanna and Wagle (1989), these authors sought to discover why

different customers who had expended the required (baseline) effort for a given product, experience different levels of satisfaction. The authors Hanna and Wagle (1989) introduced the Optimal Stimulation level (OSL) which indicates that different stimulation or excitement levels exist for different people for a particular product or service. Adopted from the optimal stimulation theory, which states that "every individual seeks an optimal stimulation level (Hanna and Wagle 1989), the authors identified that there exist different things that are of interest, stimulate and excite people with respect to a particular product or service, such as the quality, price, availability, aftersales maintenance, etc. Hanna and Wagle (1989) in conclusion showed through their studies that the OSL greatly influences the effort expended by an individual with respect to the level of satisfaction experienced.

3.3.3 Three factor theory of satisfaction:

This theory holds that there exist three satisfaction factors that enhance satisfaction and they can be distinguished from each other (Fuller and Matzler, 2008). The idea behind this theory was initially developed by Kano (1984) cited in Fuller and Matzler (2008), with reference to the two factor theory of job satisfaction proposed by Herzberg, Mausner and Snyderman (1959) cited in Fuller and Matzler (2008). According to Fuller and Matzler (2008), it is important to identify which attributes (product and service) increase satisfaction with an improved performance in such attributes, as well as those that cause dissatisfaction only by their absence. The three satisfaction factors include

a. Basic factors (*dissatisfiers*): these are minimum requirements that do not lead to satisfaction if fulfilled or exceeded but will lead to dissatisfaction if absent. An asymmetric relationship exists between this basic factor and overall satisfaction as a low factor performance has a higher impact on overall satisfaction, than on high factor performance. Basic factors are totally expected and its fulfilment is necessary, although the fulfilment of the basic factor is not a sufficient condition to ensure satisfaction.
b. Excitement factors (*Satisfiers*): these factors increase satisfaction if present, but their absence does not lead to dissatisfaction. An asymmetric relationship also exists between the excitement factor and overall satisfaction as high factor performance on this factor has a greater impact on overall satisfaction than on low performance. Excitement factors amaze the customer and are known to generate delight especially as they are not usually expected.

c. Performance factors (*Hybrids*): these factors lead to satisfaction with high factor performance, and dissatisfaction with low factor performance. In this case, there exists a linear and symmetric relationship between factor performance and overall satisfaction.

In order to obtain satisfaction, Fuller and Matzler (2008) conclude that these satisfaction factors must be identified in any product or service organization as a thorough knowledge of them greatly influences the overall customer satisfaction and this research is concerned with that customer satisfaction in Government construction projects. Armed with the theoretical understanding of satisfaction, the research continues with a definition of customer satisfaction while observing diverse perspectives and consequently, providing a working definition for this research.

3.4 Customer satisfaction; a construction perspective.

According to Maloney (2002), the term customer satisfaction is one synonymous to "expectancy disconfirmation", a process whereby it cannot be refused that a product or service meets or exceeds the expectations of the customer. In order words, the customer usually compares the quality of performance to his or her expectations and this determines either satisfaction or dissatisfaction. The term expectation refers to beliefs that serve as a standard or reference point for any activity (Martin and Simmons, 1999). Conceptually, customer expectations' can be seen as the customer defined probabilities of positive and negative events that could occur if the customer engaged in a particular activity. This engagement could be in terms of investment, purchasing, paying and/or utilising a product or service (Martin and Simmons, 1999).

Karna (2004) on the other hand, sees customer satisfaction as a function of perceived quality and disconfirmation. Disconfirmation here refers to the extent to which perceived quality fails to match, meet and exceed repurchase expectations. Customers usually compare the perceived performance from a product (or project) with some performance standard identified above as the customer expectation. Positive disconfirmation occurs when the perceived performance is greater than the performance standard, thus implying customer satisfaction. However, customer dissatisfaction occurs when the perceived performance falls short of the performance standard and this is known as negative disconfirmation (Karna, 2004). Karna (2004) further identified the need for firms and organisations to periodically measure customer satisfaction and learn how satisfied its customers were in order to develop possible ways of improvement. Customer satisfaction is therefore defined as a function of quality,

whereby customers' expectations are either met or exceeded. Existing literature on customer satisfaction (Torbica and Stroh, 1999; Torbica and Stroh, 2000; Johnson *et al*., 2002; Yang and Peng, 2008; Chi and Gursoy, 2009), suggest that the primary precursors of satisfaction are product and service performance and the customers' expectations in regards to that performance. The question then arises, how can one measure the customers' expectations in relation to the quality of performance from the finished project (product or service)?

3.4.1 Customer expectations

Prevailing literature on customer satisfaction and customer quality expectations (Martin and Simmons, 1999; Maloney 2002; and Karna, 2004) in summary suggest seven different types of customer expectations that could influence customer satisfaction. They include;

a) Expected standard: referring to what could easily be expected as a result of existing available information.
b) Normative/ standard expectation: this is the available general expectation irrespective of information.
c) Predictive expectations: this includes the estimates of anticipated performance.
d) Ideal expectations: this involves a level of performance wished for.
e) Minimum tolerable expectation: the customer's least acceptable level of performance
f) Desired expectations: a high level where the customer wishes or wants the product to perform.
g) Deserved expectation: this involves what the customer feels they deserve based on their financial involvement or investment.

3.4.2 Contractor re- patronage

Owing to the fact that there exists a common process whereby a client pays a contractor to carry out a construction project, the activities of the contractor could lead to satisfaction or dissatisfaction. In a situation where the customer expectations are either met or exceeded, re-patronizing a contractor for services well rendered would be expected but is not usually the case. Contractor re- patronage refers to a situation where a contractor is called upon to carry out a construction project based on the feedback from previous construction activities (Weil, 2005; Whittaker *et al.*, 2007; Pritchard *et al.*, 2009; Eadie and Graham, 2014). Within the Nigerian construction industry, contractor re-patronage is seen as yardstick for measuring satisfaction (Aniekwu, 1995, Pritchard *et al.*, 2009 and Idoro, 2010). Stemming from the hospitality and sales sectors, employing the use of feedback mechanisms usually inform clients on the efficiency of contractors and could determine their re- use for carrying out

services. Although the current construction practices advocate equality and fairness and conformation to the '*due process*' in allocation of construction jobs (which include a bid and tender process made available to all interested firms), satisfaction from previous construction activities can also be identified and measured through feedback or post project evaluations as well as the choice of a particular contractor based on previous records.

3.4.3 Contractor referral

Similar to contractor re-patronage, contractor referral is a process where a contractor is given reference to carry out a particular job and hence may be selected in preference to another during the bid and tender process (Idoro, 2010; Masrom *et al.*, 2013; and Xiong *et al.*, 2014). Consequently, construction firms have modified and developed their operational strategies to enhance satisfaction obtained from the constructed project as this could enhance referral opportunities.

This research is unique as it is concerned with government construction projects which are chiefly for infrastructural development. In these projects, the funding comes from the public, either through taxes or internally generated revenue (IGR), carried out basically by contractors and utilised by the public (Figure 3.1). Torbica and Stroh (2001) argue that in construction projects, the extent of customer satisfaction is only known late in the project when most of the customers' money has been invested. They call for an identification of the various attributes that affect customer satisfaction early enough in order to modify such an organisations' current offerings. Thus, this research focusses on the two types of customers defined above (Paying and using customer) as they require different sets of criteria in judging their expectations and hence satisfaction throughout the entire project life cycle. Consequent to the earlier definition of the customer, the client (government) who pays contractors for a project does not usually use the constructed project, further offering clarity on the personality of the customer or end user. In order to establish, measure, and develop ways of meeting or exceeding customer expectations, several researches have been carried out and diverse models formulated in various sectors and they are identified herewith.

3.4.4 Justification of selected satisfaction attributes:

For purposes of this research and in accordance to the research scope, two attributes of satisfaction namely contractor re-patronage and contractor referral have been adopted as measures of customer satisfaction. Satisfaction was defined as a psychological phenomenon arising when customer expectations have been either met or exceeded (Maloney, 2002; Karna, 2004; Yang and Peng, 2008; Chi and Gursoy, 2009). Hence, in order to obtain

satisfaction, expectation needs to be known. Owing to the fact that the construction customer has a higher influence on a construction project post execution, the knowledge of customer expectation can only fully be rated on the completion of the construction project. Satisfaction from a constructed project can thus be estimated from the customers' rating of the contractors who delivered the road construction project. Many contracting firms carry out post-project evaluations in order to appraise their construction practice, identify areas that need improvements as well as manage the knowledge acquired from carrying out a construction project, especially as every project is unique and is accompanied by its unique risks and challenges (Koster, 2010). Consequently, a situation whereby a construction contractor is given referral based on previous work carried out, or re-patronized by a client as a result of past excellent construction practice, would be an indication of the level of satisfaction obtained from the constructed project. In the course of this research, two attributes of customer satisfaction were adopted as they give a wholesome representation of construction satisfaction especially from the perspective of the customer or users. The advantages as well s limitations of using a dual measure of satisfaction against a singular measure of satisfaction are presented below.

3.4.5 Advantages and limitations of a dual measure of construction satisfaction:

The advantages and limitations of adopting a dual measure of customer satisfaction over a single measure of satisfaction are presented in Table 3.1.

Table 3.1: Advantages and limitations of dual measure of customer satisfaction

Dual measure (re-patronage and Referral)	Single measure
Provides a holistic view of customer satisfaction based on reference and patronage for past construction activities.	Provides a singular view of customer satisfaction which may be deficient of other factors.
Generates more accurate data which can be subjected to diverse forms of analysis such as comparative, correlational and regression analysis.	Generates data specific to the measure of customer satisfaction investigated. Data obtained can be subjected to linear methods of analysis.
Enhanced validity of findings as data obtained can be subjected to more complex and rigorous modes of analysis.	Validity of findings is limited to the single measure of satisfaction investigated.

Adapted from (Pritchard *et al.*, 2009; Idoro, 2010; Masrom *et al.*, 2013 and Eadie and Graham, 2014).

With the identification and justification of the adopted measures of customer satisfaction in construction, an inquiry into other factors responsible for customer satisfaction are explored through the customer satisfaction models.

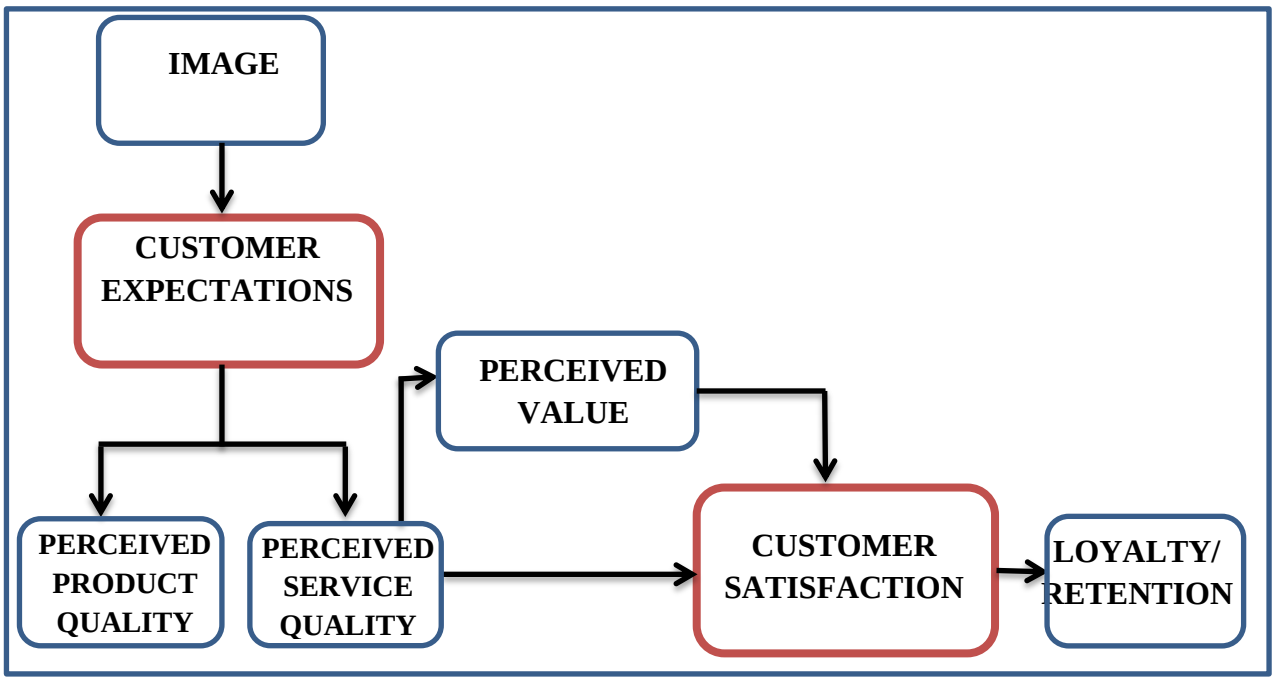
3.5 Customer satisfaction models:

Globally, efforts have been made to identify customer needs and expectations in producing products and offering services. Freshminds (2006) highlighted a number of models used in obtaining satisfaction indices for various sectors of the economy, outlining the benefits and limitations of the implementation of such models. Freshminds (2006) add that a customer satisfaction index is an economic indicator that denotes customer satisfaction within a specific sector or a particular organization whereas a model refers to a schematic description of a theory or phenomenon whose characteristics describe the processes involved with such theory or phenomenon. The American and European customer satisfaction indices as well as diverse satisfaction models are discussed below.

3.5.1 The ACSI satisfaction model:

The most widely utilised index of customer satisfaction is the American Customer Satisfaction Index (ACSI) (Fornell *et al.*, 1996; Anderson and Fornell, 2000; Freshminds, 2006). Originally designed for the private sector, the ACSI conceptualizes customer satisfaction as a weighted average of three survey ratings which are perceived quality, perceived value and customer expectations. Developed in the United States of America (U.S.A), the ACSI was intended to provide vital information on the quality of services and products in the private sector of the US economy and compliment other existing indicators of customer satisfaction (Freshminds, 2006).

The ACSI index has a reasonable satisfaction evaluation methodology and has been used to measure satisfaction in the transportation, communication and utilities sectors, the manufacturing industries, finance and insurance services, as well as public administration and government establishments (Fornell *et al.*, 1996; Anderson and Fornell, 2000; Yang and Peng, 2008). Figure 3.2 shows a diagrammatic illustration of the ACSI satisfaction model.



Source: (Freshminds 2006).

Figure 3.2: The ACSI Satisfaction evaluation model

Freshminds (2006) highlights on the ways agencies utilise data obtained through the ACSI and the results obtained and they are represented in the table below.

Table 3.2: Utilisation vs Results from ACSI.

Agency Utilisation of ACSI	Results obtained
• Test results against current assumptions • Re-examine improvement plans and strategy • Report results to Congress, employees and customers • Design and conduct more detailed drill-down surveys on low-performing areas • Identify strategic benchmarking partners	• Increased budget • Better image • Higher loyalty • Reduced costs • Greater trust.

Adopted from Freshminds (2006).

However, Johnson *et al*., (2002) argue that the ACSI satisfaction evaluation model cannot be adapted to government construction projects or the construction industry in general. This is due to the fact that the results obtained from the ACSI satisfaction evaluation system are highest for competitive products, lower for competitive services and retailers and lowest for government and public agencies. Construction projects, which are a hybrid of products and

services, require optimum results in achieving customer satisfaction in both the product and service aspects.

Johnson *et al*., (2002) further advocate for the development of a new evaluation model for both the construction industry as well as construction project management (CPM) services. Additionally, Chan *et al.,* (2003) point out that several other national consumer satisfaction indices (CSI's) have been developed for domestically purchased and consumed products. Examples include the Swedish customer satisfaction barometer (SCSB) to determine customer satisfaction in locally manufactured items, and the Norwegian customer satisfaction barometer which has been in operation since 1996 (Fornell *et al.,* 1996; Chan *et al.,* 2003). These indices complement the traditional customer satisfaction procedures and serve as standards not only for the concerned firms, but also to shareholders, investors, regulatory bodies as well as the government (Chan *et al.,* 2003).

3.5.1.1 Advantages of the ACSI Model

Freshminds (2006) presented a number of advantages associated with the ACSI model and they are:

- Implementation of the ACSI offered improved accuracy in the budget and cost planning. This is due to the fact that the ACSI captures perceived value, perceived quality and customer expectations in both the product and service aspects, and makes provisions early enough in the planning stages.
- The implementation of the ACSI enhances trust and loyalty to the offered product or service. This is obtainable as the antecedents of customer satisfaction are a direct reflection of the perceived product and service value expressed by the customer.
- The iteration involved in implementing the ACSI ensures a focus on the actual needs of the customer and probable actions to be carried out by the congress and employees.

3.5.1.2 Limitations the ACSI Model

- The ACSI was originally developed for the private sector where a positive correlation existed between profits and customer satisfaction.
- The model operated on generalization (obtaining an average) of customers quality, value and expectations and hence omitted specific antecedents of customer satisfaction.
- The ACSI model lacked credibility in identifying the importance (high or low) of customers perceived quality, value and expectation.

3.5.2 The EPSI satisfaction model

The European Index of Customer Satisfaction EPSI is the European equivalent of the ACSI and consists of customer satisfaction programs in a large number of European countries (Freshminds, 2006). Although the EPSI utilization is strongest in Sweden where it covers 70% of Gross Domestic Product (GDP), across participating countries in Europe the model has been implemented in specific public sector organisations such as healthcare, education and the pharmaceutical industry. Similar to the ACSI, the EPSI conceptualizes customer satisfaction as a weighted average of the customers' expectations and the perceived quality with the aim of building trust in the organization / firm, through prompt resolution of customer complaints. Figure 3.3 shows a representation of the EPSI model of customer satisfaction.

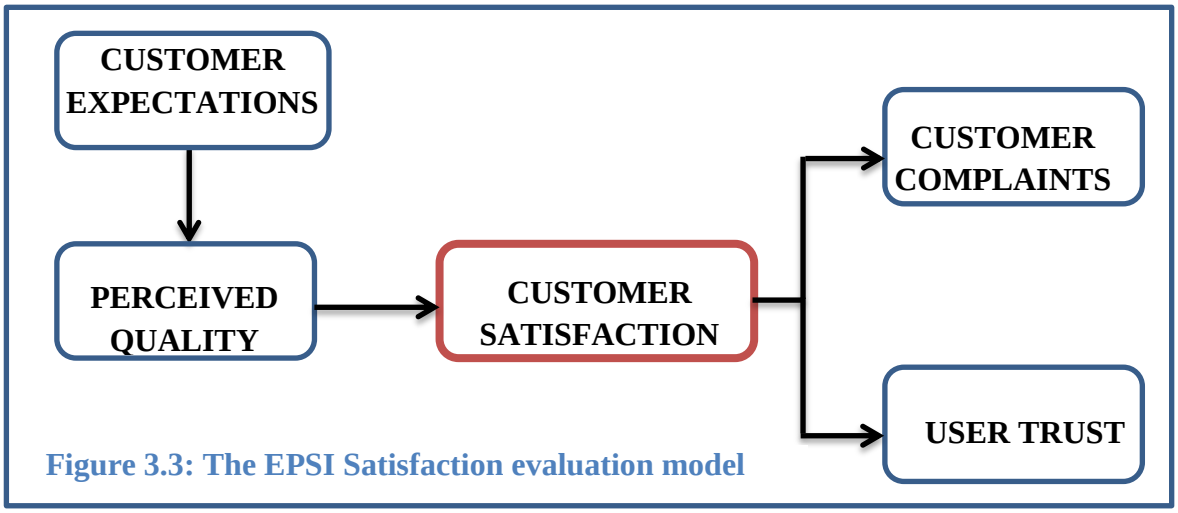


Figure 3.3: The EPSI Satisfaction evaluation model

Souce (Freshminds, 2006).

Freshminds (2006) further adds that in as much as the EPSI has been implemented in specific public sector organisations, it has sparingly been implemented in several other public sector organisations such as transportation and construction. Notably however, the EPSI has been effectively utilised in private sector organisations. This is because there is no re- purchase needs in public sector organisations, hence the absence of a loyalty or retention characteristic in the EPSI model when compared to the ACSI model.

Both the ACSI and EPSI obtain data from computer- assisted telephone interviews where respondents are asked questions particular to a specific product or service within a defined time frame. A 10- point Likert scale is employed to evaluate responses based on the respondent's expectations, perceptions and degree of satisfaction. Final assessments are then made on the overall quality and satisfaction of the service or product, aggregated and input in an econometric equation, which calculates the index of satisfaction (Freshminds, 2006).

Although, this model can be used in public sector organisations such as organisations involved with Government construction projects, the model is usually not utilized as the results obtained are lowest for public and Government agencies (Johnson *et al*., 2002).

3.5.2.1 Advantages of the EPSI Model

- Implementation of the EPSI has been shown to improve trust between stakeholders (clients and customers) in the public sector where there exists no re- purchase need.
- The model captures customer complaints and acts accordingly responding to particular issues in customer dissatisfaction. This is responsible for its wide implementation in the education and healthcare sectors, where welfare and wellbeing are of paramount interest.

3.5.2.2 Limitations of the EPSI Model

- Analysis is based on mean responses hence the omission of specific issues on customer dissatisfaction and customer complaints.
- Sparingly implemented in the transportation and construction sectors due to their dynamic nature and accompanied uncertainties.

3.5.3 HOMBSAT satisfaction model:

In order to efficiently measure customer satisfaction in the home buying sector, Torbica and Stroh (2000) developed a home- buyer satisfaction model called HOMBSAT. First developed in 1997, the model consisted of three dimensions which included house design, house, and services. Figure 3.4 shows a pictoral description of the HOMBSAT model.

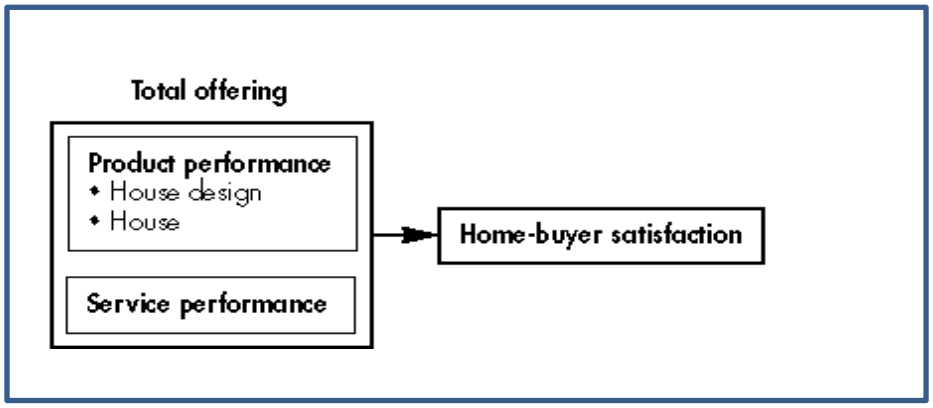


Figure 3.4: HOMBSAT Satisfaction model

Source: Torbica and Stroh, (2000).

Owing to the fact that satisfied customers were the strength of any home building firm, customer satisfaction was identified as a selling point of such firms, hence the need to design

and develop a model to ensure such satisfaction. The house design and house indicators were used to rate the product quality while the service indicator was used to measure service quality.

According to Maloney (2002), service quality, defined as the *"customers overall impression of the relative inferiority or superiority of the organisation and its services",* was an issue of major concern when examining customer satisfaction. This was attributed to the fact that in recent times, customers craved for high quality but at a low price. Detailed literature review resulted in the generation of 83 items, 36 representing house design, 17 representing house and 30 representing service quality. A total of 545 questionnaires were distributed and 295 completed and returned. These questionnaires utilised a seven point Likert type scale for each item and the data obtained was analysed using the SPSS statistical package. In conclusion, the HOMBSAT informs one on the satisfaction ratings in the three dimensions of house design, house, and service quality. It can also be used by home builders to track, compare and contrast home buyer satisfaction from different projects or geographic locations.

3.5.3.1 Advantages of the HOMBSAT model

- Incorporates customer satisfaction into both the product and service attributes of a building construction project.
- The HOMBSAT model is designed to improve satisfaction in the home buying activity as well as the rate the level of satisfaction of the customer (home buyer).
- The HOMBSAT model accommodates a wide range of customer expectations and is guided by the assumption that the satisfaction antecedents and inexhaustible.

3.5.3.2 Limitations of the HOMBSAT model

- There exists a disregard for other stakeholders' satisfaction as much emphasis is placed on the home buyer satisfaction.
- The three dimensions of house design, house and services do not fully cover the requirements in home buying such as the physical environment and the economy.

3.5.4 Dual influence model:

Maloney (2002) recommended that contractors needed to establish partnerships with their respective labour to enhance customer satisfaction. Consequently, a research by the North Dakota State University (Cook *et al.*, 1997) in Maloney (2002), while researching on electrical construction projects proposed a dual- influence model. The model involved five dimensions which included contractor/customer relationship, project management, safety, prepared/ skilled work force, and cost.

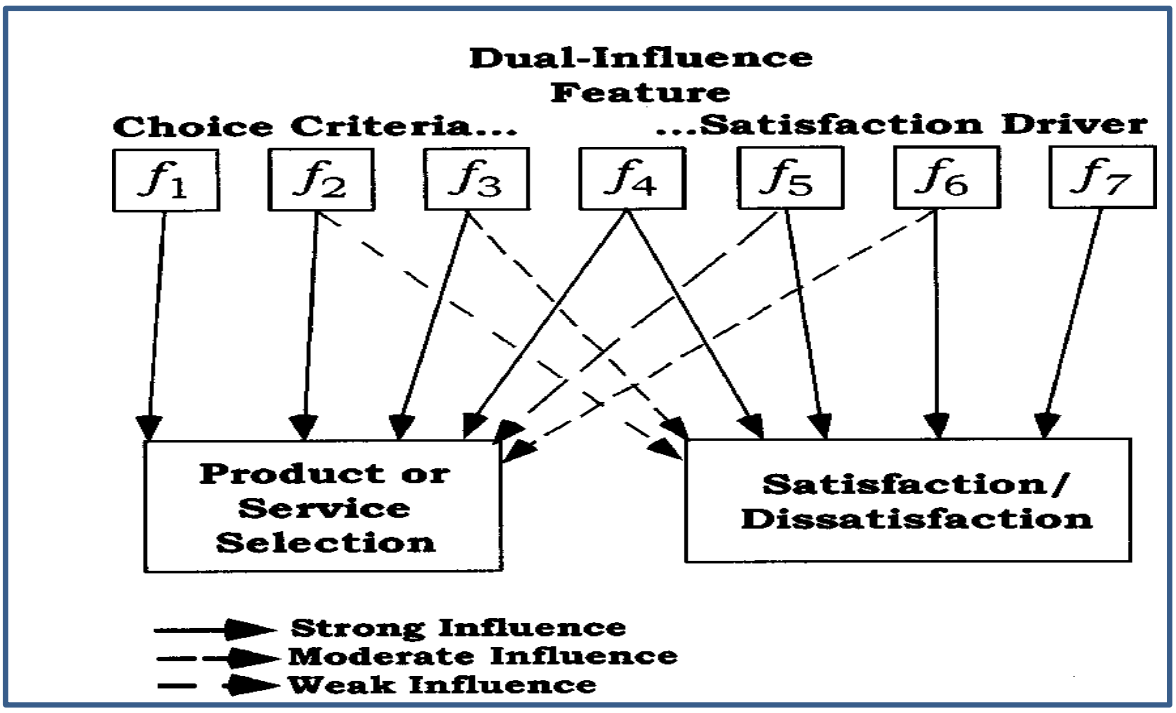


Figure 3.5: Dual Influence model

Source: Maloney, (2002).

These five dimensions were used to evaluate customer satisfaction and for contractor selection. Questions were drawn from these dimensions in form of a questionnaire and these generated elements which could be translated into expectations for satisfaction purposes. For example, one of the identified elements of satisfaction from the project management dimension was "completing project milestones on or ahead of schedule". Identification and implementing this element would influence the product or service selection (contractor selection) and in turn influence the level of customer satisfaction or dissatisfaction (Maloney, 2002).

3.5.4.1 Advantages of the Dual influence model

- The dual influence model aids in efficient and effective contractor selection. This is obtainable through the identification of strong, medium and weak influences of the contractor on both the product or service selection and customer satisfaction.
- Implementation of the dual influence model involves interpreting specific customer expectations to generate customer satisfaction antecedents.

3.5.4.2 Limitations of the Dual influence model

- Complexity in the implementation of the dual influence model increases with an increase in the number of contractors, subcontractors, and suppliers.

- Managing partnerships between client and contractor(s) may lead to responsibility duplication, whereby a single person has multiple responsibilities, hence causing delays in task completion.

3.5.5 SERVQUAL model

The SERVQUAL model was initially developed by Parasuraman *et al.,* (1985) with the intention of bridging the gap between customer expectation and customer perception in the service industry. Parasuraman *et al.,* (1985) identified 10 dimensions for the identification of service quality and they are facilities, reliability, responsibility, communication, credit, security, qualification, politeness, understanding of the client, and availability. However, later research on service quality (Parasuraman *et al.,* 1991; 1994), summarise these dimensions into five major headings as discussed below;

1) Facilities: physical facilities, organization accommodations and staff appearances

2) Reliability: the ability to perform services precisely and reliably

3) Responsibility: disposition to quickly serve the clients

4) Guarantee: knowledge and politeness of the staff and their ability to produce reliability and assurance

5) Sympathy: personal attention to each client

Adopted from Abari *et al.,* (2011).

In the SERVQUAL model, questionnaires are utilised to measure performance across these five dimensions, using a seven point Likert scale, capturing both customer expectations and perceptions.

Figure 3.6 shows an illustration of the SERVQUAL model for confirmatory factor analysis in the I.T sector.

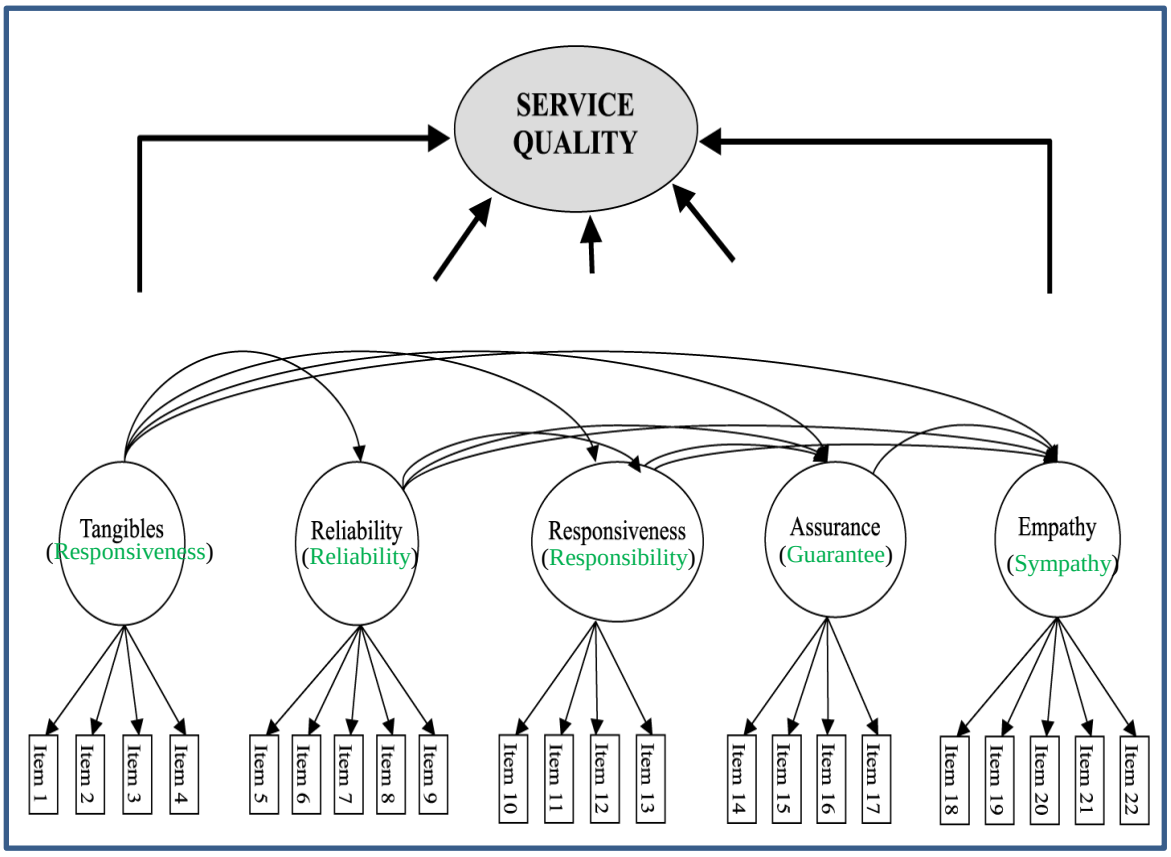


Figure 3.6: SERVQUAL model
Source: Badri *et al.*, (2005).

3.5.5.1 Advantages of the SERVQUAL model

- SERVQUAL implementation informs management of improvement opportunities obtainable from the ratings of the five attributes.
- Provides adequate information on achieving customer satisfaction through the revelation of strengths and weaknesses in the service delivery.
- Identification of the gaps in SERVQUAL implementation aids in developing organisational strategies that ensure sustainability of customer satisfaction.
- Areas of weakness in customer service delivery are identified through the SERVQUAL implementation with the relevant importance of the weakness highlighted.

3.5.5.2 Limitations of the SERVQUAL model

- Authors such as Cronin and Taylor (1992) and Teas (1993) criticise the efficacy of the SERVQUAL, model. They condemn the measurement of customer expectations in service quality research, adding that measuring perception is sufficient enough.

- Although the SERVQUAL model is widely used in various sectors, it lacks clarity on how to bridge the gap between expected and predicted service quality. (Badri *et al.*, 2005)

3.5.6 Building performance model:

Liu (1999) through her post occupancy evaluation (POE) sought to research into residential satisfaction from housing estates in Hong Kong. She developed the building performance model, outlining the benefits obtainable from the POE.

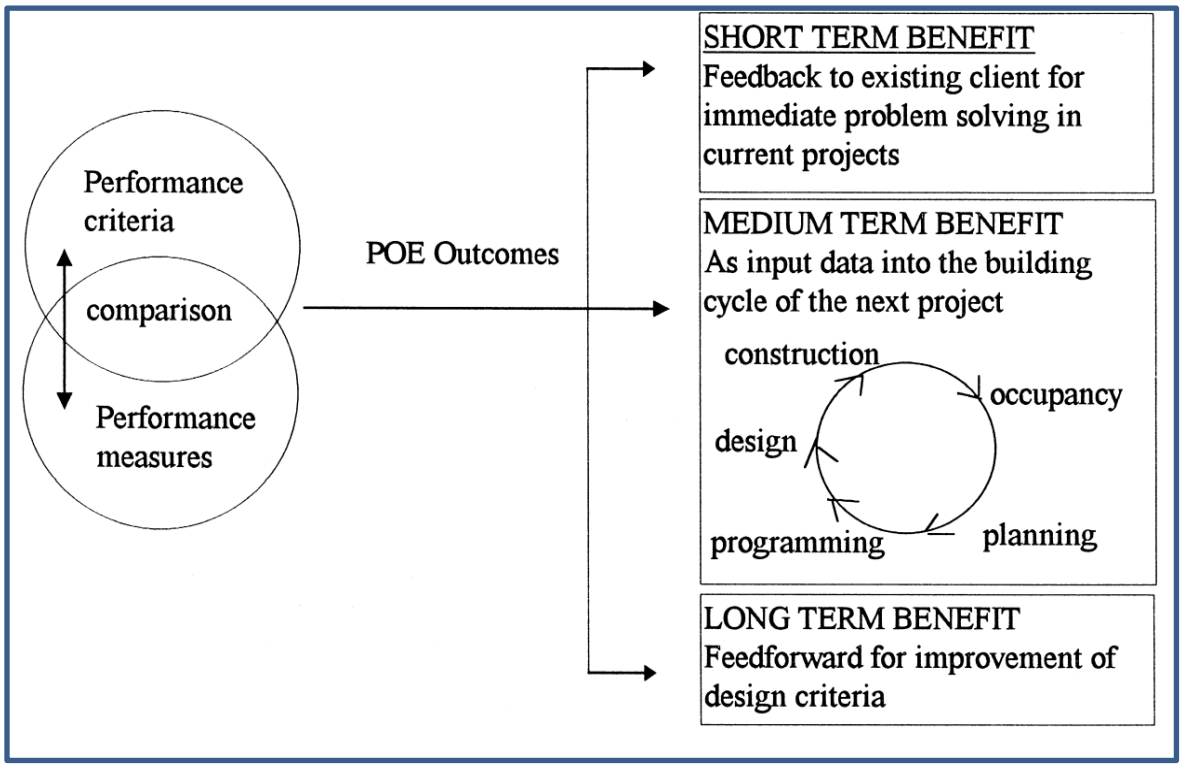


Figure 3.7: Building performance model (BPM)
Source: Liu (1999).

In order to achieve the research aim which was obtaining overall satisfaction in the housing estates, a questionnaire comprising of a total of 51 questions from 9 categories was raised. Factor analysis to bring out the expressed evaluations was carried out and the data obtained, subjected to regression analysis with overall satisfaction of the building being the dependent variable. The purpose of the questionnaires was to determine which features of the home and its surroundings were primary attributes to overall satisfaction.

3.5.6.1 Advantages of the building performance model

- Implementation of the BPM ensures sustainability of future building projects as the feedback obtained is input into the new design process.

- The BPM pays attention to individual antecedents of satisfaction as overall satisfaction post occupancy was the major aim.

3.5.6.2 Limitations of the building performance model

- POE is accompanied by varying costs which may not be included in the design or operations budget.
- Finding the appropriate skill set to carry out a POE is quite tasking.

3.5.7 The KANO Model of customer satisfaction:

The KANO model of customer satisfaction (Kano *et al*., 1984; Xu *et al*., 2009), is one of the oldest models of customer satisfaction. Developed in 1984 by Dr Noriaki Kano (Kano *et al*., 1984, cited in Shahin, 2004), the KANO model incorporates the product attributes based on how they are perceived by the customer. More recent studies (Yang, 2005; Chen and Chuang, 2008) have demonstrated the product and service attributes of the KANO model, its effect on customer satisfaction and its applications to both product and service development and improvement. It is also observed that in the past decade, many more firms have in addition to the KANO model, incorporated quality management standards and systems such as ISO 9000, ISO 14000, quality functional deployment (QFD), TQM and quality control circle (QCC), all in an effort to achieve customer satisfaction and gain competitive advantage (Torbica and Stroh, 1999; Tan and Shen, 2000; Yang, 2005; Xu *et al*., 2009).

According to Yang (2005), organisations are not only concerned with attracting new customers, but also in the retention of old customers to sustain competitiveness and long term profitability. Also, Chen and Chuang (2008) identify that customer satisfaction has become a prerequisite and a major concern for competitiveness in today's dynamic global market. They point out that an understanding of the customers' perception of product and service quality influences the design decisions, and has an adverse effect on the customers' satisfaction. This is due to the fact that customers evaluate the quality of a product or service using various factors and dimensions, hence the need to identify which criteria create the most satisfaction in comparison to others. Accordingly, the knowledge of these criteria inform a design team on areas to be targeted to ensure maximum benefits in customer satisfaction and these are addressed by the KANO model, Figure 3.8 (Chen and Chuang, 2008).

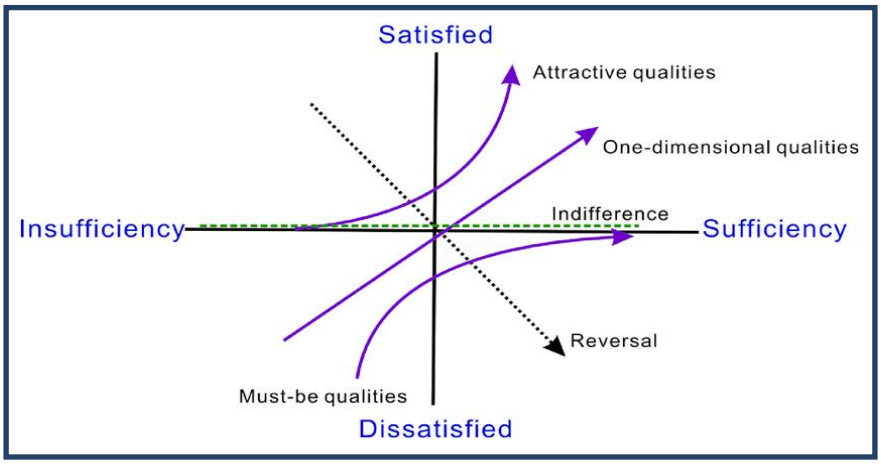


Figure 3.8: The KANO model

Source: Chen and Chuang, (2008).

The KANO model of customer satisfaction divides the product criteria into three distinct categories, with each category having a different effect on the customer. They are

1. The must-be or basic quality: also known as the threshold attribute, this includes the expected attributes or "musts" of a product. Customer dissatisfaction is experienced when this product criterion is absent or very low. However, even in the presence of a high- performance product criterion, customer satisfaction from this attribute does not exceed the neutral sufficiency level as illustrated in the model above (Chen and Chuang, 2008). In summary, the must- be or basic quality is an attribute whose absence results in customer dissatisfaction but its presence doesn't necessarily guarantee customer satisfaction.
2. One dimensional or performance quality: Also known as the performance attribute, the customer satisfaction here is a linear function of a products performance criterion. The price customers are willing to pay for a particular product or service is determined by this category and the philosophy of 'more is generally better' applies. In this category, a greater performance always leads to high customer satisfaction and vice versa.
3. The attractive or excitement quality: Usually referred to as the excitement attribute, this category deals with the unspoken or unexpected customer requirements. Customer satisfaction increases super-linearly with an increase in this attribute, although its decrease or absence has minimal effect on the customer satisfaction. The identification of the attractive or excitement quality offers competitive advantage, especially in a situation where similar products or services are offered by several

firms. This is because this attribute attends to the customers 'unknown needs' thereby positively influencing their choice in selection and satisfaction.

In addition to the three categories mentioned, two other categories are identified and they are the indifference and the reversal quality attributes. However these categories have little or no impact on the customer satisfaction although the presence of a reverse quality attribute leads to customer dissatisfaction while its absence leads to customer satisfaction (Chen and Chuang, 2008).

3.5.7.1 Advantages of the KANO model

The advantages obtainable in applying the KANO model as well as the various quality management tools that can be incorporated into the model are summarised in the table below.

Table 3.3: Advantages/ Activities of interest in the KANO model of customer satisfaction.

KANO model advantages	Categories involved	Quality management tools involved	References
Identifying customer needs	The must- be or basic quality, One dimensional or performance quality	ISO 9000, ISO 14000, Feedback/ customer input	Yang (2005), Kano *et al.*, (1984), Xu *et al.*, (2009).
Determining functional requirements	One dimensional or performance quality	Prioritisation matrices, value analysis	Yang (2005); Xu *et al.*, (2009).
Concept development	The must- be or basic quality, One dimensional or performance quality	QFD, TQM	Tan and Shen (2000), Yang (2005).
Analysing competitive products	The attractive or excitement quality	TQM, QCC.	Chen and Chuang (2008)

TQM= Total quality management

QFD= Quality functional deployment

QCC= Quality control circle.

3.5.7.2 Limitations of the KANO model

- The KANO's model only classifies the performance of satisfaction attributes without stating the severity or importance of such attributes.
- In order to remain competitive, firms are saddled with the provision of excitement attributes against the usual must- be or performance needs. This is quite expensive and requires special skill set to achieve.

- The KANO model fails to explain what triggers customers perceptions and expectations and the level of importance or relevance of these perceptions and expectations.

3.5.8 The refined Kano model:

Owing to the weakness in determining the degree of importance of quality attributes in the Kano model, Yang (2005) sought to refine the Kano model. In a study carried out by Yang (2005), the Kano model was further broken down from three major categories to four categories to improve the precision in determining the quality factors and attributes influencing customer satisfaction. Fig 2.8 shows the refined Kano model with the additional attributes.

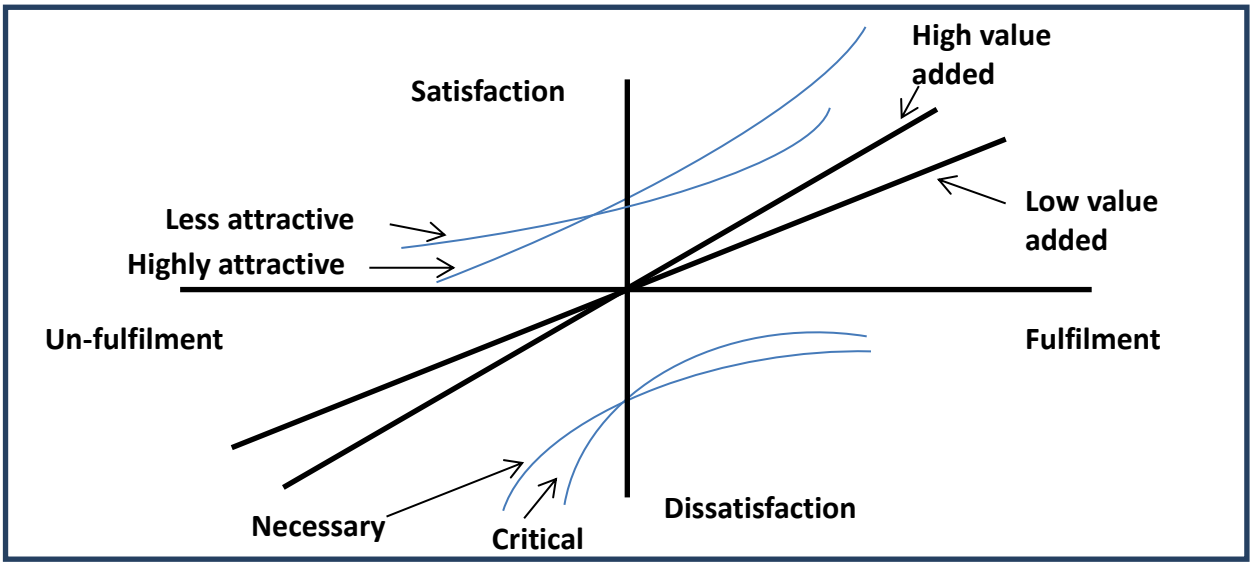


Figure 3.9; The Refined KANO model.

Source: Yang (2005).

To demonstrate the application of the refined Kano model, Yang (2005) designed and distributed 1400 questionnaires of which 150 valid responses were recorded. The questionnaires were designed to cover the importance of quality attributes, the satisfaction of quality attributes and categorise those attributes according to the Kano model. Based on the deviations from the means for importance and satisfaction, these attributes were represented on the Importance- Satisfaction (I-S) model. Figure 2.9 shows a diagrammatic illustration of the I-S model.

3.5.8.1 Advantages of the Refined KANO model

- Greater precision in identifying the performance attributes with knowledge on relevance and importance.

- The refined KANO model implementation enhances performance strategy formation.

3.5.8.2 Limitations of the Refined KANO model

- Maintaining competitive advantage involved the provision of critical, high value added and highly attractive excitement attributes. Again, this is quite expensive and involves special skills in terms of personnel, equipment as well as research and development (R&D).

3.5.9 The I-S Model

This model presents the relationship between the satisfaction level and the degree of importance of such satisfaction attribute. Customers quality expectations are represented on the model and their deviations from the means of both the satisfaction and importance show the extent of importance or relevance of the quality expectation.

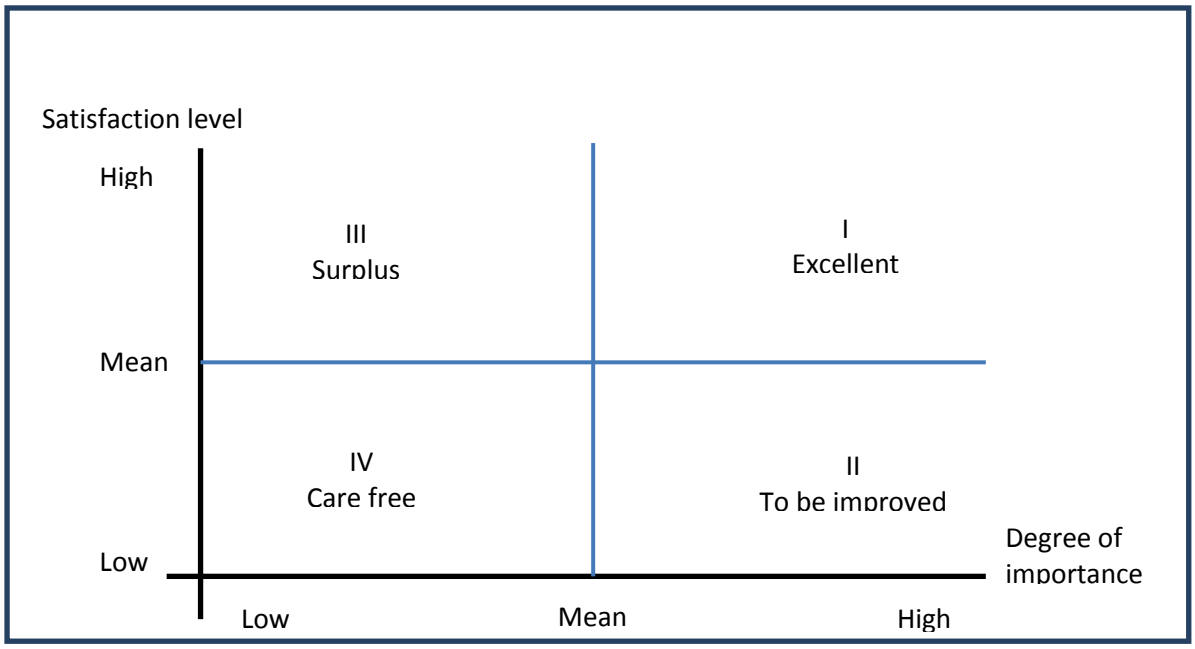


Figure 3.10: The I-S Model
Source: Yang (2005).

The refined Kano model when applied with the I-S model, break down the customers quality expectations into smaller and more precise categories, hence making it easier to determine areas that would greatly influence customer satisfaction. It should however be noted that the refined Kano model was not only a practical tool for industries but also a theoretical model for academic research (Yang, 2005).

Research carried out by Ahmed and Kangari (1995) sought to analyse client satisfaction factors in the construction industry. Their research utilised six client satisfaction factors which included time, cost, quality, client orientation, communication skills and response to complaints to conduct a survey for analysing the client satisfaction factors in the construction industry. Their methodology involved a structural equation model illustrating the

interdependencies of the factors influencing customer satisfaction in the construction industry. This was generated from 831 assessments from project customers with regards to successful projects. Their findings revealed the complexity of customer satisfaction in the construction industry, where various factors had different impacts on the customers' perceived quality. They also discovered the two dimensions of a contractor's ability to cooperate which were managing changes and communication, stressing the significance of communication in project execution. Furthermore, the research by Ahmed and Kangari (1995) stresses the significance of the entire project management process alongside the six client satisfaction factors in ensuring customer satisfaction.

3.5.10 Model for evaluating client satisfaction with PCM services

Research according to Chen *et al.,* (2010) sought to provide a model for evaluating client satisfaction with professional construction management (PCM) services in Taiwan. Working in the educational sector, they identified that major public construction projects in Taiwan, were renowned for poor quality, chiefly caused by the absence of adequately qualified personnel. Consequently, construction projects such as the primary school construction project in this case, were subjected to strict government construction regulations. 19 primary school construction projects were analysed and data was obtained through questionnaires and interviews to generate the proposed model.

The model consisted of 5 phases which included planning, Architect selection, design, bid and tender and construction and 40 service demand items (SDI's). Analytical Hierarchy Process (AHP) algorithms as well as Simple Additive Weighting Methods (SAWM) were employed to assign weights to the SDI's. Results from the analysis reveals that much emphasis was placed on the planning and design phases as this was necessary for effective client satisfaction. However, weaknesses were observed in the degree of innovation and the quality of supervision at the implementation stage of primary school construction projects in comparison to other constituents of Engineering consulting phases such as construction and handover. Figure 3.11 shows a diagrammatic illustration of the model for evaluating client satisfaction with PCM services in Taiwan (Chen *et al.,* 2010).

3.5.10.1 Advantages of model for evaluating client satisfaction with PCM services

- Greater emphasis on planning and design phases.
- Satisfaction seen as a function of quality of service, product and manner to customers.

3.5.10.2 Limitations of the model for evaluating client satisfaction with PCM services

- Lack of innovative approach and quality of supervision.

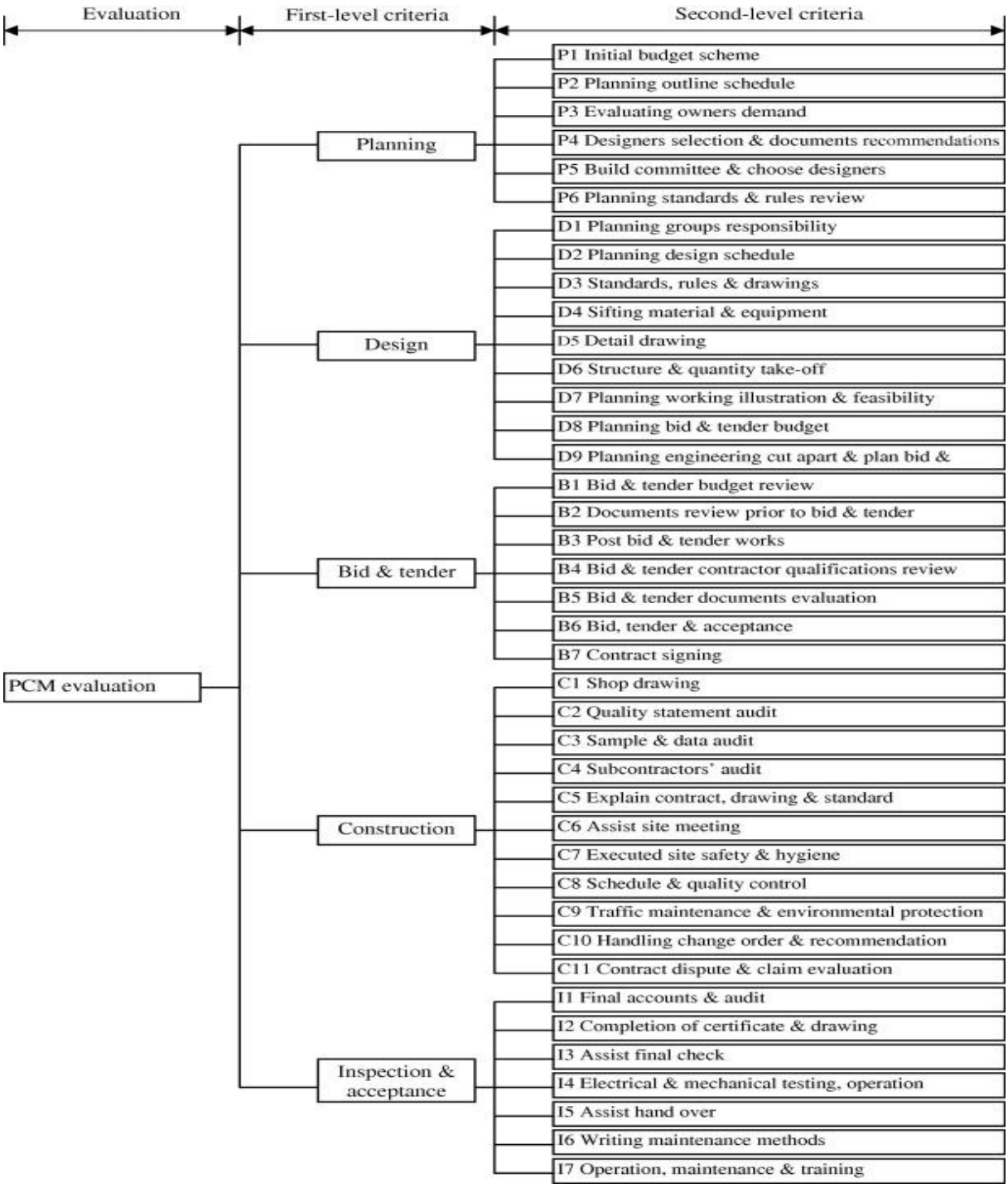


Figure 3.11: Model for evaluating client satisfaction with PCM services in Taiwan
Source: Chen *et al.*, (2010).

3.5.11 Client satisfaction from Engineering consulting services

Research carried out by Tang, Lu and Chan (2003) sought to identify the list of factors and their accompanied indicators for measuring client satisfaction from Engineering consulting services. They identified that internal and external client satisfaction was a function of quality of service, quality of product and quality of manner to customers. Their research employed the use of multiple linear regression analysis to analyse data obtained from 47 professionals

from the Hong Kong construction industry. From their research, two major areas of weakness were identified which included the degree of innovation and the quality of supervision at implementation stage. These areas needed urgent attention to achieve adequate client satisfaction, although the research also proved that the quality of Engineering services in Hong Kong were slightly higher than supposed.

3.5.12 Failure mode and effects analysis (FMEA):

Vermilion (2002) investigated into improving customer satisfaction in the service industry using the failure mode and effects analysis (FMEA). The author argues that in the service industry, corrective measures taken to allay customer dissatisfaction once it has occurred are usually futile. The need to avoid applying these futile corrective measures becomes necessary as customer satisfaction has a positive influence on the firms' competitive advantage, as well as the future existence of such service firm. Consequently, with the high cost in redesign, liabilities, transaction costs as well as ultimate customer dissatisfaction, FMEA implementation becomes imminent (Vermilion, 2002).

FMEA involved identifying failure even before occurrence, ensuring a potential reduction in errors and little or no customer dissatisfaction. With FMEA implementation, every possible scenario of customer dissatisfaction is anticipated, analysed, and possible solutions proffered to remedy such dissatisfaction in the event of its occurrence. This careful analysis is performed for every stage of the service delivery, prior to the actual offering of service. Although, there is no singular model or methodology to determine customers' expectations (Vermilion, 2002; Karna, 2004; Johnson *et al*., 2002), the FMEA offered an avenue to correct both obvious and particular issues that could lead to customer dissatisfaction throughout the service life cycle, even before its occurrence.

In summary, there abounds rich literature on measuring and improving customer satisfaction in various sectors involving both product and service organisations. Diverse methodologies have been employed to obtain empirical data in these fields, identifying weaknesses and strengths in the factors influencing customer satisfaction. However, one key discovery from the literature is the dependence of customer satisfaction on the quality of product or service, of which construction projects are a combination of. The need to identify and outline the extent of this dependence especially in the Nigerian construction industry is imperative to ascertain areas that need improvements.

Table 3.3 gives a summary of the various customer satisfaction models and related research, the sectors such models have been tested and recommended as well as the diverse constituents identified within these models and related research.

3.5.13 Customer satisfaction models and related research:

Table 3.4: Customer satisfaction models and related research.

MODEL/ RESEARCH	CONSTITUENTS	SECTORS	ORIGIN/ METHODOLOGY	REFERENCES
ACSI	• Perceived quality, • Perceived value, • customer expectations	Transportation, communication, manufacturing, utilities, public admin and Government.	• America -Interviews	Chan *et al.*, (2003)
EPSI	• Customer expectation • Perceived quality • Customer complaints • User trust	Healthcare, Education and the Pharmaceutical industry.	• Europe -Interviews	Freshminds (2006)
HOMBSAT	• House design • House • Service (all involving product and service quality).	Home buying, design, construction and sales.	• Europe Literature review and Questionnaires	Torbica and Stroh (1999), Torbica and Stroh (2000), Maloney (2002).
SERVQUAL	• Facilities • Reliability • Responsibility • Guarantee • Sympathy	Service quality	• America Literature review and Questionnaires	Parasuraman *et al.*,(1985), Parasuraman *et al.*, (1988,1991), Abari *et al* (2011)
Dual influence model	• Contractor/ customer relationship • Project management • Safety • Prepared/skilled workforce • Cost	Electrical construction projects	• America -Questionnaires	Cook *et al.*,(1997), Maloney (2002).
Building performance model	• Short term benefits- direct feedback to input in current project • Medium term benefits- input into building cycle through planning, programming, design, construction and occupancy. • Longterm benefits- forward feed to improve future design criteria.	Housing estate constructions.	• Japan -Questionnaires	Liu (1999)
Kano Model	• Product or service attributes based on customer perception, • Must be (Basic/Threshold) quality attribute	Product and service firms/ industries, companies/ organisations.	• Japan -Questionnaires	Kano *et al* (1984); Yang (2005); Chen and Chuang (2008) Xu *et al.*, (2009).

	• One Dimensional (performance) quality attribute • Attractive (excitement) attribute • Indifference quality attribute • Reversal quality attribute			
Refined Kano model.	• Quality decisions with precision • Attractive- Highly and Less • One dimensional- High and low value added quality • Must be- Critical and necessary quality attributes • Indifferent- Potential and care free quality attribute.	Product and service firms/ industries, companies/ organisations	• Japan -Questionnaires	Yang (2005)
The I-S Model	• Importance of quality attributes • Increased precision	All Product and service firms/ industries, companies/ organisations	• Japan - Questionnaires	Yang (2005)

The models reviewed and presented in the table above were all geared at improving customer satisfaction in the different areas examined. Re- occurring attributes like customer expectations, customer benefits, presence of performance and excitement attributes were seen to be the foundation of the satisfaction models. However, in the Nigerian construction industry, there seems to be a lack in the presence of these attributes especially due to the perceived problems such as lack of technical expertise and poor policy implementation (Oluwakiyesi, 2011; Odediran *et al.,* 2012). Considering GCP's, which are carried out for infrastructural development rather than financial gains, there seems to be a greater desire for customer satisfaction. This research bridges the gap between meeting or exceeding customer expectations in GCP's and offering modalities that would improve the construction project quality. The constructs of the variables discussed in this study are thus summarised from the analysis of the models and other adjoining literature.

3.6 Discussion of the models

The literature review on customer satisfaction, the various models and relevant research were all geared towards identifying areas on improving customer satisfaction that have been researched on, as well as areas which required more research. The review revealed literature on improving customer satisfaction in product and service organisations (Chen *et al.,* 2010;

Yang, 2005; Kano, 1994; Torbica and Stroh, 2000; Chan *et al.*, 2003), models and research to improve customer satisfaction in firms producing products, making sales and in turn generating revenue or getting Returns On Invested Capital, ROIC (Torbica and Stroh, 1999; Kano *et al*., 1996; Yang, 2005). The review also highlighted on models on improving customer satisfaction in firms to enhance competitive advantage, market value and share price (Vermilion, 2002; Tang, Lu and Chan, 2003; Liu, 1999). In addition, the review highlighted on research involving enhancing customer satisfaction in construction projects, and projects involving client- contractor relationships where the client funds the project, and the contractor constructs and manages the project according to the clients' specifications.

However, there is little or no literature on improving customer satisfaction when considering Government construction projects, where funding usually comes from a budget made up of Internally Generated Revenue IGR and proceeds from local and international trade (exports). The IGR is basically a fall-out from the public or citizenry, and in this case this public/ citizenry are referred to as the customers for the government construction projects. In addition, most of the research on improving customer satisfaction has been carried out in geographical areas such as America, Europe and Asia, with minimal attention on Africa and its environs. Hence, this has informed the researcher to investigate into improving customer satisfaction in Government construction projects in Nigeria with a look at the quality aspects of various on -going and completed Government road construction projects within the Port Harcourt metropolis in Rivers State, Nigeria.

3.7 Discussions from the literature review (Chapters 2 and 3).

The literature review covered key sections in the research on improving construction project quality and customer satisfaction within government road construction projects in Rivers State, Nigeria. Identifying the constructs of construction project quality, the attributes of satisfaction in a construction perspective as well as an overview of satisfaction models were highpoints of the literature review. In addition, an overview of existing construction management literature on what has been previously done in enhancing satisfaction in construction and other sectors were captured. Consequently, a précis of the findings from the literature review is presented below.

Construction: Construction in the context of my research was defined as the branch of production which involves the physical act and art of transforming designs and plans into concrete tangible structures.

Project: A project refers to a unique temporary activity carried out within the constraints of time, cost and quality, to achieve set out objectives that bring about change.

Construction Project: a branch of production which involves the erection or reconstruction of structures and/or buildings for financial gains or infrastructural development, carried out to achieve a particular purpose within specified limits of quality, cost and time and bring about change in the process.

Satisfaction: Satisfaction is defined as a psychological phenomenon describing the emotional state resulting from an evaluation of the perceived discrepancy between prior expectations and the actual performance of the product.

Customer: A customer, when considering construction projects is defined as a person, or group of people who purchase, pay for, or utilize the construction product or service.

Quality: Quality in the light of this research is defined as the positive worth of a product or service in relation to its conformance to requirements, suitability for use, and potential for ensuring satisfaction.

Success from the project life cycle (PLC) is obtainable from fulfilling the objectives of the firm and the client. Objectives of the firm include increased productivity, improved service, customer loyalty, high reputation leading to new businesses. The clients' objectives include, functional / operational satisfaction, aesthetic satisfaction, on time completion, completion within budget constraints, obtaining value for money.

The project life cycle involves four unique phases which include Project initiation, project planning, project execution and project closure. The constituents of the project life cycle have been summarised into Table 3.5.

Table 3.5 : Table showing the findings from the project life cycle.

IINITIATION	PLANNING	EXECUTION	CLOSURE
Research problem identification	Project plan	Physically build deliverables	Perform project closure/ hand over
Business case	Resource plan	Monitor and control time, cost quality, risk issues, Procurement, acceptance, and communications	Review project completion.
Feasibility study	Financial plan	Stage gate/ phase review.	
Final solution and terms of reference	Quality plan		
Project team formation	Risk plan		
Project office arrangement	Acceptance plan		
Phase review	Procurement plan		

Customer satisfaction involves

- Prior expectations (positive or negative customer effort/ expectations). These include; expected standard, normative expectation, predictive expectation, ideal expectation, minimum tolerable expectation, desired expectation and deserved expectation
- Customer perception
- Actual performance
- Exceeding the optimal satisfaction level (OSL)
- Basic satisfaction factors
- Excitement factors
- Performance factors
- Short, medium and long term benefits
- Attracting new customers and retaining old customers
- Perceived and actual quality, value and expectation
- Handling customer complaints
- Improving customers overall impression
- Improving contractor/ customer relationship, cost, project management, safety. Prepared skilled workforce for contractor selection.

Quality management in construction involves

- Quality tools such as Quality functional deployment QFD, Total quality management TQM, Effective quality management EFQM, Lean and Six Sigma, all geared at improving production and service processes and in turn improve both product and service quality.
- Quality planning, quality control and quality improvements.
- Measurable quality attributes which must conform to specifications and standards such as the ISO 9000 and ISO14000 standards.
- Elimination of waste and rework which bring about high costs.
- Meeting legal and aesthetic requirements

Quality is a pre requisite for client satisfaction, an element of satisfaction, and an attribute of satisfaction in the construction industry.

These findings are the basis for the constructs of the conceptual framework and consequently the foundation of the survey questions employed in this research. The findings were categorised under 5 headings, Project Performance, Reliability, Aesthetics, Contractor Referral and Re-patronage, which capture project quality and customer

satisfaction in construction (Fig 3.12 and Fig 3.13). These relationships and interactions between these headings would be discussed in detail in the following chapters. Consequent to the findings from the literature review, a conclusion had to me made on the best method to be adopted to establish the nature of relationship between the attributes of quality (Project quality in this case) and the attributes of satisfaction (Customer satisfaction in this case). The decision on the appropriate research method to be adopted was based on certain criteria. These included the nature of the research questions, the type of information sought after, the available resources as well as the time available for carrying out a research of this nature. The following chapter presents the research methodology and provides a justification for the method adopted.

3.8 The conceptual framework linking project quality to customer satisfaction

The review of literature succeeded in identifying grey areas in research that have not been discussed in detail concerning construction project quality and its potential to offer satisfaction. The concluding parts of the previous chapter highlighted variables of project quality while this current chapter highlights areas or ways of offering satisfaction while handling projects. With the selection of three key areas to be researched on which include project performance, reliability and the aesthetic content of government road construction projects in Nigeria, guidance through a conceptual framework cannot be over emphasized. Miles and Huberman (1994:18) defined a conceptual framework as a visual or written product, one that "*explains, either graphically or in narrative form, the main things to be studied—the key factors, concepts, or variables—and the presumed relationships among them*". Furthermore, according to Miles and Huberman (1994) and Robson (2011) it is opined that the conceptual framework is a vital part of any research as it highlights the system of concepts, assumptions, expectations, beliefs and theories that support or inform ones' research. These authors however note that a conceptual framework is basically an idea on what is planned to be studied or investigated and this aids the research design. There exist four distinct ways of developing a conceptual framework and they include

a. Experimental knowledge
b. Existing theory and review of literature
c. Pilot studies and exploratory research
d. Thought experiments.

In developing the conceptual framework for this research, the knowledge of existing theories on satisfaction, and review of existing literature was considered. A review of the attributes of

project quality responsible for offering satisfaction, as well as a review on the various satisfaction models aided in developing the conceptual framework for the research.

3.8.1 Constructs of project quality attributes

Section 2.17 highlighted the attributes of project quality while Table 2.4 provided the summary of performance indicators from literature summarised in Ali *et al.,* (2013). The literature identified re-occurring performance indicators which make up the factors that enhance performance in construction. Accordingly, these factors have been categorised and the constructs for performance are specified and they include concerns on project cost, organisational team work, project design specifications, project abandonment, patronage from suppliers, health and safety considerations as well as motivation for construction. Defining performance as the manner in which a constructed project fulfils its intended purpose other factors that influence the performance of road construction projects could be grouped into incorporating the commuting needs of customers into construction, enhanced project supervision as well as the nature of conflict resolution in terms of handling complaints. These constructs are however developed and modified from Ali *et al.,* (2013).

From the frequency of performance indicators in construction literature in table 2.4, reliability and aesthetics had minimal research content. Reliability, which was defined as the probability that an item would perform its required function without failure within the constraints of time and other set out conditions involves optimising external activities associated with the constructed project. Summarising these activities the factors used to ascertain the presence of reliability includes the use of professional experts for construction activities involving project design, project monitoring, maintenance, inspection and bench marking. In addition to the civil and structural components of a road construction project, the constituents of reliability aid in ensuring that the project lasts longer without failure, living up to or exceeding its expected life span.

Aesthetics from table 2.5 also had minimal research attention based on the articles reviewed and summarised in Ali *et al.,* (2013). Defined as the physical and visible aspect of a constructed project, aesthetics are responsible for satisfaction based on the visible expectations of the users or customers and these are readily available by vision (Pheng and Chuan, 2006). Although the aesthetic content of a constructed project is usually visible during the execution and hand over stages of the project life cycle, plans for its existence run throughout the project life cycle, from conceptualisation to handover. Consequently, a

summary of the constituents of aesthetics obtained from literature (Pheng and Chuan, 2006; Ali *et al.,* 2013) include the implementation of quality standards, technological advancements, considerations for efficient materials and durable finishing, considerations for health and safety as well as post project evaluations. These constructs for the basis of the questions that would be asked in the survey on enhancing project quality and customer satisfaction within government road construction projects in Rivers State, Nigeria.

Consequently, the interactions between the variables for this study are presented in figure 3.13.

3.8.2 Variables

The dependent variable as highlighted from the literature is customer satisfaction, while the independent variable is project quality. However, in order to fully capture aspects of the independent variable (project quality) that influence the dependent variable, the aspects of project performance, project reliability and project aesthetics would be considered. Figure 3.13 shows an illustration of the constructs that define project quality within the confines of this research.

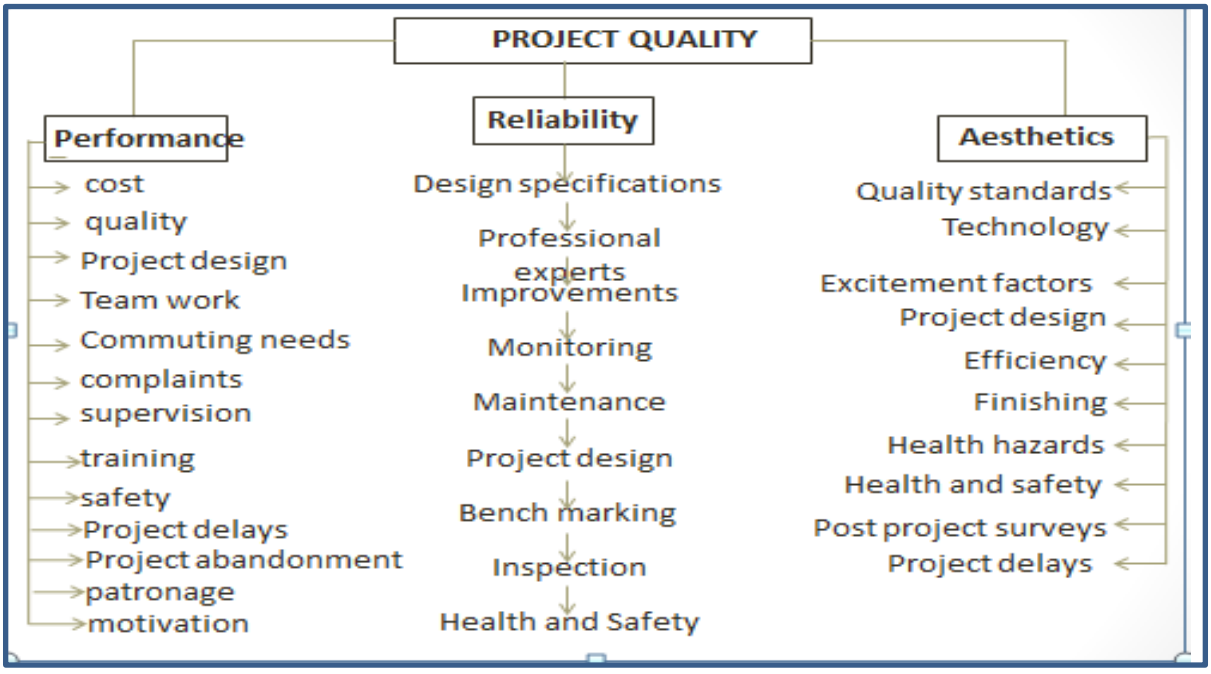


Figure 3.12: Constituents of the variables of project quality.

Contractor referral and re-patronage on the other hand are presented as measures of customer satisfaction within government road construction projects. Literature according to Jakpar *et al.,* (2012) suggests that adequately meeting the requirements and needs of a construction project encourages the use and re-use of the contractors that handled such project. These

requirements are basically based on agreed costs, on-time delivery and the quality of the finished project. In addition, the presence of excitement factors, the ease of pedestrian and vehicular movement during and post construction as well as incorporating the labour and resources from host communities are all facets of both contractor referral and re-patronage and in turn customer satisfaction. Whereas this study is concerned with establishing the relationship between project quality and customer satisfaction, the conceptual framework is thus presented. The framework is presented with the presumption that customer satisfaction is dependent on the nature of the project quality.

Consequently, the conceptual framework proposed for this research is given below

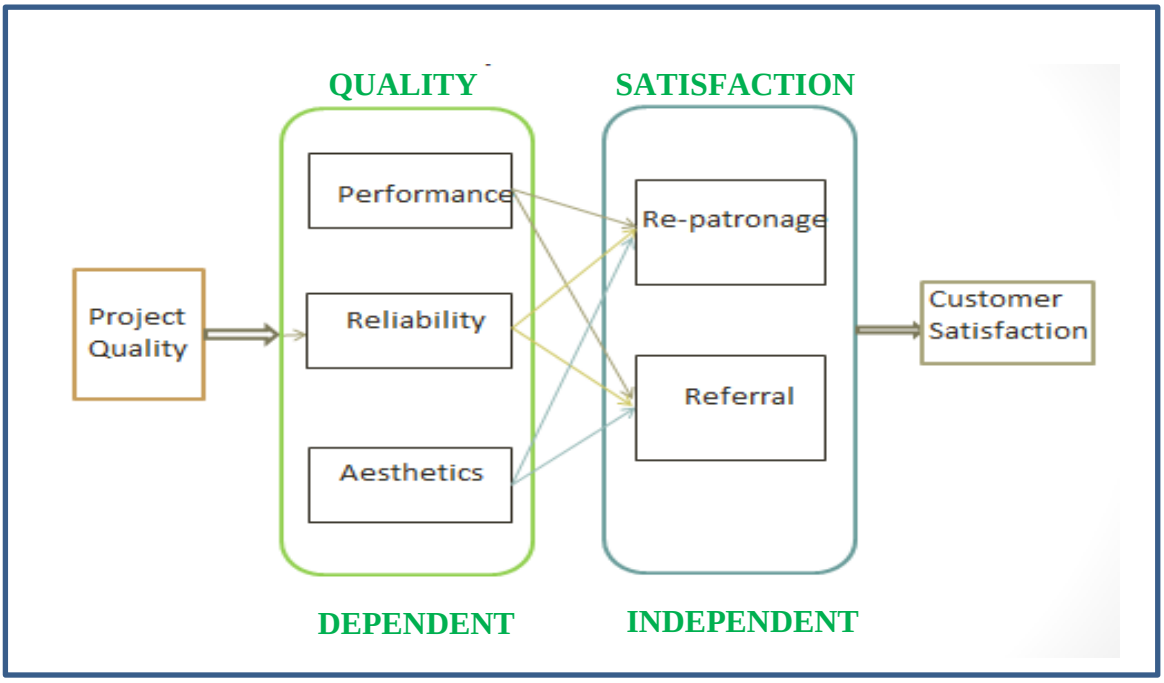


Figure 3.13: the conceptual framework proposed for the research

3.8.3 Dependencies

The key dependency to be discussed in this research is the effect of project quality on customer satisfaction while carrying our government road construction projects in Nigeria. The research methodology adopted would however address this dependency, offering percentage contributions of the various constituents of the independent variable, project quality, on the constructs of the dependent variable, customer satisfaction. The next chapter would shed more light on the adopted research methodology, providing justifications for choice and relevance.

3.8.4 Relationships

The relationships to be explored in the course of this research are guided by the research questions and they include

a. The effect of project performance on contractor re-patronage and referral

b. The effect of project reliability on contractor re-patronage and referral

c. The effect of project aesthetics on contractor re-patronage and referral

d. The combined effect of project quality on customer satisfaction within government road construction projects in Nigeria.

3.9 Summary of chapter 3:

This chapter aimed at providing a synopsis on customer satisfaction in the construction industry. Through the theoretical underpins of satisfaction, the chapter offered explanations to the requirements for satisfaction, such as expectations, excitement factors and contractor referral amongst others. The satisfaction models analysed were geared at conceptualizing satisfaction and relating it to the construction sector. The chapter concludes with the conceptual framework guiding this research and the following chapter, the research methodology, would endeavour to provide a valid means of obtaining data that would explain the conceptual framework.

4. CHAPTER 4 RESEARCH METHODOLOGY

4.1 Introduction

The previous chapter outlined the findings from the literature review stating the intrinsic characteristics of Nigerian construction projects and the antecedents of obtaining customer satisfaction from such construction projects. Through the conceptual framework, an approach to obtain data relating to the research aim was arrived at, with the identification of the dependent and independent variables associated with this research. This chapter captures the procedure which the research was conducted to ascertain ways of enhancing project quality and consequently, customer satisfaction in Government road construction projects (GCP's). The chapter also entails the research design and the adopted research method employed in achieving the research aim, providing justification for the various selected choices.

4.2 Research styles

A research is defined as a systematic collection and interpretation of information with a clearly defined objective of finding out things (Saunders *et al.*, 2009). Ritchie and Lewis (2003) add that the general purpose of research is to gain information and seek understanding to certain phenomena in a consistent, clear, understandable and rigorous manner. In gathering information while carrying out a research, there are distinct characteristics which must exist. These include a systematic and organised mode of data collection, a valid means of interpretation of such data as well as a clear illustration of the research purpose (Saunders *et al.*, 2009). Diverse research styles exist such as theoretical, constructive, empirical, comparative, explanatory, exploratory, action, etc. and the nature of information sought would determine the research style to adopt. Research on customer satisfaction in construction management (Torbica and Stroh, 2000; Johnson *et al.*, 2002; Yang and Peng, 2008; Chi and Gursoy, 2009; Xiong *et al.*, 2014; Okoye *et.al.*, 2015) however highlight the utilisation of exploratory and explanatory research styles employing both qualitative and quantitative research methods to collect and interpret information from stakeholders engaged in construction projects. In practice however, Onwuegbuzi and Johnson (2004) posit that research in general employs a mix of different styles depending on the nature of information sought and this is also applicable to research in construction management. This research adopts both the exploratory and explanatory research styles which entail a mix of descriptive quantitative and regression analysis research methods; although a descriptive qualitative research method was adopted for the framework validation. This choice was found suitable as the research first sought to find out the perceptions of the participants on issues relating to

project quality and customer satisfaction, measuring responses through Likert scales (descriptive quantitative). The research further went on to establish relationships and percentage contributions of the independent variables on the dependent variables (regression analysis). These would be addressed extensively in this chapter. Table 4.1 however provides a brief description of the various styles of research and their associated methods.

Table 4.1: Description of different research styles and associated research methods.

Evidence of effectiveness	Research Method	This is …	This works best for these kinds of questions…	This doesn't work well for these kinds of questions…	Additional Things to Note
LOW ↓	**Descriptive-Qualitative (Ethnography/ Case Study)**	Detailed descriptions of specific situation(s) using interviews, observations, document review You describe things as they are.	How do people implement this program? What challenges do people face? What are people's perceptions?	Did the program cause any changes in participants' outcomes?	
	Descriptive-Quantitative	Numerical descriptions (frequency, average) You measure things as they are.	How many people are participating in this program? What are the characteristics of people in this program? How well did participants in this program do?	Did the program cause any changes in participants' outcomes? Why did the program work this way?	
	Correlational/ Regression Analyses	Quantitative analyses of the strength of relationships between two or more variables (e.g., are teacher qualifications correlated with student achievement?)	What is the relationship between various school or classroom context factors and student achievement? Is the extent of implementation of a program across sites correlated with better outcomes?	Did the program cause any changes in participants' outcomes?	Look for words such as, "more likely than," "less likely than," "associated with," "related to," and "correlated with."
	Quasi-experimental	Comparing a group that gets a particular intervention with another group that is similar in characteristics but did not receive the intervention—**no random assignment used**	Did the program cause any significant differences in participants' outcomes as compared to non-participants with similar characteristics who did not receive the intervention?	How are people implementing the program? Why did the program get the results it did?	Look for the phrase "compared with." Look for results that are both statistically significant and meaningful. NOTE: Did the study test the equivalence of treatment and control groups prior to the intervention?

Table 4.1: Cont'd. Description of different research styles.

Evidence of effectiveness	Research Method	This is …	This works best for these kinds of questions…	This doesn't work well for these kinds of questions…	Additional Things to Note
↓ HIGH	**Experimental**	**Using random assignment** to assign participants to an experimental or treatment group and a control or comparison group (e.g., one receives the intervention and one does not)	Did the program cause any significant differences in participants' outcomes as compared to the control group's outcomes?	How are people implementing the program?	Look for words such as, "causes" or "leads to." Look for results that are both statistically significant and meaningful. NOTE: The intervention should be clearly defined so that you know what it was designed to entail, and to what extent it was implemented in the study. Also look for information on the experience of the control group.
	Meta-analysis	Synthesis of results from multiple studies to determine the average impact of a similar intervention across the studies	Over all studies conducted on a particular intervention or strategy, what can be said about the direction or strengths of the impacts? What does the totality of research studies say about the effectiveness of a program?	How are people implementing the program? What are people's perceptions?	Look for selection criteria used to include studies and look for measures of effect size. Look for differences in results among the studies. Do some studies show positive results while others show negative or do all studies show positive results?

Source: SERVE (2008)

4.3 Research design

The research design is defined as the specification of the logical processes for obtaining information in a research. It entails a logical framework that stipulates the type of information to be acquired, the research tools required as well as the sources from which data would be collected. According to Saunders *et al.*, (2009), a research design is a thorough outline of how a research would be carried out outlining what type of data would be collected, the sources of this data, the tools for its collection and intended means of analyzing the collected data. The research design is believed to provide logical proofs that aid the researcher to draw up inferences concerning the investigated variables. In the words of Yin (2014), a research design deals with a logical problem rather than a logistical problem. Adherence to the logical nature of a research design therefore enhances the validity of the inferences drawn from the research. Whereas Congdom and Dunham (1999) opine that a clear definition of the "beginning" of a project stating its goals and justification is an indication of the probability of success of such a project, it is imminent to design a research in such a manner that local conclusions and inferences can be drawn up from the data obtained. Hence the research design is viewed as the starting point of any research as it outlines a step- by- step illustration of the adopted research methodology.

The research design, also referred to as the research strategy is influenced by a number of factors. These include the research objectives, the level of existing knowledge in the research area, the philosophical underpins, available resources at the researchers' disposal as well as the time frame to conduct the research (Saunders *et al.*, 2009). The level of existing knowledge and the philosophical considerations are discussed thus.

4.3.1 The level of existing Knowledge on project quality and customer satisfaction

Knowledge as defined by the Oxford dictionary involves facts, theoretical or practical information and skills acquired either through experience or education (Oxford, 2004). In other words, knowledge could be acquired from existing theories, or created from practical experiences. In order to capture existing knowledge on customer satisfaction and its relation to project quality, a number of methods of knowledge generation have been exploited. These include academic publications, journal articles, relevant and recent books, websites, government databases, and organizational reports (Saunders *et al.*, 2009).

4.3.2 Philosophical paradigms in research

A philosophical paradigm otherwise known as the research paradigm entails the philosophical underpinnings of a particular research. According to Cohen and Manion (1994), a paradigm can be described as the philosophical intent or motivation for carrying out a study. Bodgan and Biklen (1998:22) view the term 'paradigm' as *"a loose assemblage of logically related suppositions, concepts, or propositions that guide thinking and research*". Weaver and Olson (2006) from a research perspective, define the term paradigm as a "*pattern of beliefs and practices that regulate inquiry within a discipline by providing lenses, frames and processes through which investigation is accomplished*". In addition, Collis and Hussey (2009) see a research paradigm as a philosophical framework that guides how scientific research should be conducted. They go on to describe philosophy as the use of logical reasoning and arguments to obtain 'truth' and 'knowledge'. From a different perspective, authors such as Creswell (2003) and Neuman (2006) prefer to discuss philosophical paradigms with reference to knowledge claims such as epistemology and ontology, or research methodologies. Consequently, a paradigm can be described in terms of ones' belief about the nature of knowledge, the adopted methodology as well as the validity of the methodology (Mac Naughton *et al.,* 2001).

According to Bogdan and Biklen (1998) and Mertens (2005) the knowledge of a research paradigm greatly influences the pattern in which knowledge is studied and interpreted. These authors opine that in a research design, adoption of a paradigm is the foundation or the bedrock of the research adding that without adopting a paradigm, there exists no basis for methodology, methods, review of literature and ultimately, a research design. Hence, a philosophical paradigm offers a platform which consists of theories that determine the nature of a research while establishing the relationship between data obtained and its corresponding theory. Indeed the choice of adopting a philosophical paradigm is solely dependent on the researcher, adherence to the provisions of the chosen paradigm is essential. Furthermore, despite the fact that James and Vinnicombe (2002) argue that every individual possesses inherent preferences that shape the choice of research design, Blaikie (2000) and Mertens (2005) posit that a connection must exist between the adopted philosophical paradigm and the research problem, clarified through the adopted research design. Blaikie (2000) adds that

coherence in choice of research paradigm and research approach must exist as an inability to show this connection may lead to poor choice of research strategy.

In order to develop a philosophical perspective, researchers are enjoined to make several core assumptions on two distinct dimensions of research which include the nature of society, and the nature of science (Holden and Lynch, 2004). According to Holden and Lynch (2004), when considering the society, the researcher is made to assume that the society evolves rationally, with its inhabitants struggling to free themselves from the domination of societal structures. This brings about variations in opinions, attitudes and even emotions on societal issues. On the other hand, the scientific assumptions involve either a subjective or deductive approach concerning the reality of occurrences (Ontology), the concept of knowledge (Epistemology), human nature, and the chosen methodology. Considering research in construction project management, a variety of research designs with diverse philosophical paradigms has been carried out. A typical example is found in Nzekwe- Excell (2010) who identified the various means of designing research based on particular paradigms. However, Collis and Hussey (2009) highlight the two main philosophical paradigms in research which are Positivism (quantitative) and Interpretivism (qualitative). Furthermore, Collis and Hussey (2009) opine that certain philosophical assumptions on Ontology, Axiology, Epistemology and Methodology underpin the main research paradigms. These assumptions are however interrelated and it is believed that on adoption of one assumption, the others are naturally complementary.

4.3.2.1 Positivism

The positivist philosophical paradigm rests on the assumption that there exists only one social reality. This reality is also objective in nature and is usually not affected by the form of investigation employed (Collis and Hussey 2009). According to Walliman (2001: 15) cited in Collis and Hussey (2009), knowledge in a positivist perspective is derived from positive information which often contains logical mathematical proof and can be scientifically verified. Hence positivists believe that the investigator is usually independent of the reality and thus has no effect on the reality (Creswell and Clark, 2007; Creswell, 2009). In positivism, it is further assumed that social phenomena can be measured and quantified, hence its alignment to quantitative methods of analysis. There however exist criticisms to the positivist philosophical paradigm although Collis and Hussey (2009) opine that these criticisms do not make other paradigm any better. Whereas positivists believe that the

researcher is independent of the reality it is believed to be almost impossible to separate individuals from the social contexts in which they exist. In addition, the researchers' opinions, interests, values and instincts cannot be totally eliminated from the research. Furthermore, despite the fact that positivists believe in the existence of a single and objective social reality, using a single measure to describe a complex phenomenon could be misleading.

4.3.2.2 Interpretivism

The Interpretivist philosophical paradigm is characterized by the belief that social reality can be shaped by our minds and our perceptions about reality (Collis and Hussey, 2009). Hence interpretivists opine that there exist multiple realities to social phenomenon and these are subjective in nature. Interpretivism emerged as a solution to the criticisms of Positivism. Owing to the difficulty in separating the researchers' mind from what exists in the social world as obtained in positivism, interpretivism involves a situation where the researcher interacts directly with what is being researched and can affect the social reality therein. Interpretivism therefore focusses on exploring the complex nature of social phenomena and obtaining interpretive understanding of such phenomena. Interpretivists seek to describe, translate and explain social phenomena, hence its alignment to the qualitative methods of analysis. Interpretivism entails the provision of answers to questions regarding 'why,' 'when,' and 'where' as against positivists who are concerned with quantifying social reality and provide answers to "what are "'how much,' 'how many', and 'by what extent' (Collis and Hussey, 2009).

4.4 Assumptions to Philosophical paradigms

4.4.1 Ontology

The concept of Ontology refers to the study or the science of "being" and its relation to reality (Blaikie 1993; Saunders *et al.,* 2009). Ontology deals with claims about what exists, its nature, its constituents and how the constituents react with each other. In other words, ontology is concerned with identifying what actually exists and the nature of such existence. Ontology which is deeply rooted in metaphysics, a branch of philosophy (Holden and Lynch, 2004), is viewed logically as the starting point of every research and describes our individual or personal views on the nature of reality. This view may either be claims or assumptions on reality that exists objectively (physically) or subjectively (created in our minds). According to

Guarino (1995), Ontology can be seen as the study of a particular phenomenon and the world at large independent of our own knowledge about it, building information from what already exists. Ontologically, positivists believe that there exists only one social reality which is objective in nature and the researcher has no effect or relationship with that reality. However, interpretivists believe that social reality is of a subjective nature which is socially constructed. Hence the existence of multiple realities, as each individual exhibits his or her own sense of reality.

4.4.2 Epistemology

Epistemology is concerned with what is considered or accepted as valid knowledge (Collis and Hussey, 2009). This valid knowledge is categorically void of guesses, probability or luck. Coined from the Greek words, *episteme* (knowledge) and *logos* (reason), epistemology deals with the knowledge gathering process involved in research and what characterizes the information obtained as knowledge (Tan, 2002; Creswell and Clark, 2007). Epistemology involves the investigation of the relationship between the researcher and the knowledge embedded in social reality. Blaikie (1993) explains that epistemology is the theory or science of the method or grounds of knowledge. It entails assumptions on the possible ways of gaining knowledge of reality, how existing realities can be known and the criteria for describing something as knowledge. Similarly, according to Eriksson and Kovalainen (2008), epistemology deals with the constituents of knowledge, its sources as well as the boundaries of knowledge. Collis and Hussey (2009) however argue that it is difficult to differentiate between ontology and epistemology as both are concerned with knowledge. Epistemologically, Positivists are believed to maintain an objective and independent position on social reality and accept only phenomena that are observable, measurable and quantifiable as valid knowledge. On the contrary, Interpretivists are somewhat embedded in what is being researched, exhibiting subjectivity and assume that the interpretations of their beliefs make up facts that can be considered as valid knowledge.

4.4.3 Axiology

In any research, the values of the researcher plays a very important role in determining the approach adopted for the research. Axiology deals with the articulation of the values of the researcher as a basis for making decisions in a research (Collis and Hussey, 2009). Also coined from the Greek word *axios* with Latin interpretations which mean “to be strong” or

"to be worthy" (Given, 2008), axiology encompasses the issues of truth, utility, right conduct and obligation under the umbrella of values. A thorough understanding of the researchers' values therefore aids the validity of information generated or knowledge created as it is assumed that this would minimize bias, uphold the research choices made and exhibit some transparency in the entire research process. Axiologically, positivists believe that the research process is not affected by the researchers' values. This is primarily because positivists are independent of what is being researched and are only interested in the interrelationships of the '*objects'* under investigation. Although Collis and Hussey (2009) and Saunders *et al.,* (2009) opine that such beliefs are prevalent in the natural sciences, they argue that a different scenario exists in the social sciences which often deals with perceptions and behaviours of individuals. On the contrary, interpretivists believe that the researcher possesses values which influence the detection of facts, the interpretations derived from the facts and the attitude towards ascertaining knowledge.

4.4.4 Methodology

Methodology refers to the process used to collect data and information to address a particular issue (Miles and Huberman, 1994). Saunders *et al.,* (2003) further define research methodology as the theory of how a research should be undertaken, and this should include the theoretical and philosophical underpinnings upon which the chosen methods were selected. Coined from the Latin words Methodologia "*How things are done*" and Logus "*the study of*", the term methodology is distinguished from the term "Methods". Whereas methodology offers theoretical knowledge on which method (or best practice) can be employed to a specific research problem, methods outline the individual steps that are carried out to solve the research problem (Creswell, 2009; Collis and Hussey, 2009). According to Saunders *et al.,* (2003), the employed research methodology should identify the type of data needed, the location of such data, the means of obtaining such data, as well as how such data would be analysed to obtain relevant information to solve the research problem. Consequently, the method should identify the particular means of obtaining data, which may be experimental studies, numerical schemes, statistical approaches, observatory means, amongst others (Saunders *et al.,* 2003). Rajasekar, Philominathan and Chinnathambi (2013) opine that it is not sufficient to know what research method to utilize, but also the methodology behind such a method. Hence it is assumed that the knowledge of research methodology aids in determining the suitable method for a chosen problem, the accuracy and

validity of a chosen method as well as the efficiency of the method. In addition, a justification for the choice of a particular method is influenced by the knowledge of methodology. Rajasekar, Philominathan and Chinnathambi (2013) further add that whereas research methods aid in providing the solution to a problem, research methodology aids in explaining why a particular research is undertaken, how the research problem was formulated, the nature of data collected, the particular method adopted as well as reasons why a particular technique of analysis was adopted. Table 4.2 shows the world views of the assumptions to the philosophical paradigms in research.

Table 4.2: Views on philosophical paradigm and linkage to this research

World view element	Positivist	Interpretivist	Researcher
Ontology; What is the nature of reality?	Singular reality, rejecting or accepting hypothesis.	Multiple realities, providing illustrations of different perspectives.	Singular reality that Customer satisfaction can be improved by project quality (but by how much?)
Epistemology; What is the relationship between the researcher and what is being researched?	Distant and impartial, objective collection of data on instruments.	Close and influenced by the researcher, close contact and communication to collect data.	Detached from the objects of data collection (respondents) and what is being researched (interrelationships between project quality and customer satisfaction).
Axiology; What is the role of values?	Unbiased, personal views do not influence responses.	Biased, personal views may influence the nature of responses especially in interpretation of response.	Unbiased opinions, ensuring that respondents voluntarily and freely express their opinions without researcher influence or assistance.
Methodology; What is the process of research?	Deductive, top to bottom approach involving testing an a priori theory.	Inductive, bottom to top approach, starts with participants views and builds theories and generalisations based on the views obtained.	Deductive, gathering information from existing knowledge and investigating its prevalence in the Nigerian construction industry.

Source: Creswell (2012).

In order to develop the methodological considerations for the research on project quality and customer satisfaction within government road construction projects in Rivers State of Nigeria, it is essential to outline the two distinct types of research, inductive and deductive categorized as the research approach.

4.5 Research approach

In research, there exist two distinct approaches to reasoning. These approaches are characterized by the way the researcher chooses to obtain information and arrive at conclusions while carrying out a research. Trochim (2006) outlines the distinct approaches as deductive and Inductive research approaches.

4.5.1 Deductive approach

A research approach is categorized as being deductive when a conceptual or theoretical framework is developed at the beginning of the research and tested by empirical observations (Babbie, 2010). The deductive approach involves a type of reasoning whereby the researcher starts from the general or widely known perspective and concludes with a specific and more precise viewpoint. In a deductive research, progress is characterized by a movement from the known general to the unknown specific. Saunders *et.al.,* (2009) posits that with adequate planning and setting out, deductive research are quicker to complete, possess predictable time frames and thus can be regarded as possessing lower risks when compared to inductive approaches to research. According to Babbie (2010), deduction commences with an expected pattern which is tested against observations. Arguments in a deductive approach are usually based on laws, rules or particular concepts (Creswell and Clark, 2007). According to Saunders *et al.,* (2012) the deductive approach is employed when the need to test a theory arises. In this case, the researcher starts by developing a theory or hypothesis and then designs a research strategy that aids in testing the theory developed. Furthermore, Saunders *et al.,* (2009) admit that deductive type research entertain a huge wealth of literature and require a relatively shorter time to complete the study albeit that the time is allocated to data collection and analysis. They however highlight the non- return of questionnaires for example as a key risk associated with deductive approaches to research as against the non- emergence of theory which could be experienced while employing the inductive approach to research.

4.5.2 Inductive approach

The inductive approach on the other hand involves a type of reasoning where the researcher starts form a specific perspective and proceeds to making a general conclusion on the phenomena or issue being researched on. A research is categorized as being inductive when theory is developed from the observation of empirical reality. In other words, an inductive research develops ideas and abstract generalisations through detailed observation of the world

(Neuman, 2006). Collis and Hussey (2009) agree with Neuman (2006) and opine that inductive research are characterized by a process which involves moving from a specific observation to generalization or theory formation. Bernard (2011) highlights that inductive research involves pattern identification through observations and the development of the explanations from the identified patterns through the rigours of research. The inductive approach is sometimes referred to as the "bottom- up" approach where the views or the research participants are used to build wider and more generic themes. According to Trochim (2006), arguments based on experience or observations are best expressed or presented using an inductive approach. A common feature of inductive type research is the absence of hypothesis at the beginning stages of the research as the type and nature of the research findings are only known at the completion of the research. Saunders *et al.,* (2012) further add that employing an inductive approach to research would require qualitative research methods whereas deductive approaches would employ quantitative research methods for data collection and analysis.

4.5.3 Choice of approach

In the course of this research, a deductive research approach was adopted. This was basically due to the fact that the research entailed starting from the general concepts of project quality and satisfaction, and concluded with specific findings concerning Nigerian road construction projects. The analysis involved interrelationships developed from the conceptual framework and was tested using statistical means. The adoption of a deductive approach further informed the researcher to employ quantitative research methods, against the choice of qualitative research methods as obtained in an inductive research approach (Saunders *et al.,* 2012).

4.6 Research Methods

Literature on research methodology such as Creswell (2009), Collis and Hussey (2009) and Saunders *et al.,* (2012) suggest that there are basically three main research methods employed while carrying out research. These are the qualitative research method, the quantitative research method and the mixed research method.

4.6.1 Qualitative research method

The qualitative research method employs the use of words and observations to express reality while attempting to describe people in natural situations (Amaratunga *et al.,* 2002). This

method is deeply embedded in the constructivist or interpretivist philosophical paradigm which holds that no single objective reality exists out there in the world. Hence, qualitative research upholds the fact that there exists multiple truths or realities in the world as individuals may construct their own truth depending on the social, economic, political or cultural inclinations. While employing a qualitative research method, the researcher is expected to record all possible truths without identifying which one of them is closest to the truth. Ontologically, qualitative research encourages the researcher to get close to the subject matter under inquiry. In addition, qualitative research involves an inductive logical reasoning which starts with specific observations and proceeds to broader generalisations. Collis and Hussey (2009) identify that the researcher in a qualitative research commences with specific observations, proceeds to detect patterns, regularities and relationships, formulates hypothesis to explore and concludes by developing general ideologies or theories. Qualitative research has various designs such as Grounded Theory, Phenomenology, Ethnography, Narrative and Case Study.

4.6.2 Quantitative research methods

The quantitative research method is based on the positivist claim to knowledge which suggests that there exists a single objective reality or truth in the world out there (Collis and Hussey, 2009). This method entails the generation of numerical measurements of observations and verification of the theories/ laws that govern the single objective reality in the world. The epistemological consideration in a quantitative research suggests that the researcher detaches himself/ herself from the subject matter to avoid bias and subjectivisms in an inquiry (Creswell, 2009).

In a quantitative research, the researcher;

a. Is kept distant and independent from the sample to avoid bias and encourage objectivism.
b. Employs a deductive form of logical reasoning (top- down), where the researcher starts from a general information to a specific one. The researcher starts from a broad theoretical perspective and narrows down into a more specific hypothesis. The researcher further tests those hypotheses with specific data leading to a confirmation or disconfirmation of the theory.

c. Uses statistical methods to carry out descriptive and inferential numerical analysis on the data obtained. Statistical methods are also employed to test the reliability and validity of data generated and results obtained.
d. Obtains direction for the research through a detailed literature review (Creswell, 2009; Collis and Hussey, 2009).

4.6.3 The mixed- method research method

The mixed method is based on the philosophical position of pragmatism which calls for a combination of philosophies and methods for addressing social problems. The rationale behind the pragmatic approach holds that truth is what works at a particular point in time (Collis and Hussey, 2009). Hence researchers are enjoined to focus on employing all necessary philosophies, tools and methods when carrying out research to solve a particular problem. In a nut- shell, the mixed method is a combination of both qualitative and quantitative research methods. The research design adopted when employing a mixed-method research method may either be sequential, concurrent or transformative.

4.6.3.1 *Sequential*

The researcher seeks to elaborate or expand the findings of one method with another. That is the researcher can begin with a qualitative method for explanatory purposes followed by a quantitative method to aid generalisations due to large sample size involved. Alternatively, the researcher may begin with a quantitative method in which theories/ concepts are tested, followed by a qualitative method involving detailed exploration with few case studies or individuals such as focus groups (Collis and Hussey, 2009).

4.6.3.2 Concurrent

The researcher converges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. In this design, both types of data are collected concurrently (at the same time) and the study integrates the information in the interpretation of the overall results. Here, the researcher often "*nests*" one form of data within the other (Collis and Hussey, 2009).

4.6.3.3 Transformative

This refers to a situation where the researcher utilizes data collection methods that involve both sequential and concurrent approaches (Collis and Hussey, 2009).

4.7 Rationale for adopting a suitable research approach

Having identified the various research methods applicable in carrying out research, it is essential to provide justification for the adoption of a particular research approach. This is basically because authors such as Creswell and Clark (2007), Collis and Hussey (2009) and Saunders *et al.*, (2012) opine that there is no superiority of any research method/ approach over the other as all have their accompanied advantages and disadvantages. They urge that care needs to be taken in selecting a suitable research method adding that issues such as the nature of the research problem, the research audience, the available resources, the researchers' personal experience as well as available time needs to be considered. Consequently, a deductive approach and a complementing quantitative research method have been adopted for this research and this is based on the following criteria.

4.7.1 The research problem

The nature of the research problem has been identified as a key determinant factor when adopting a research approach. Literature according to Creswell (2009) suggests that a quantitative method is usually employed when a research involves testing a theory and establishing relationships between dependent and independent variables. In un-anticipated similarities, the research on enhancing project quality and customer satisfaction within government road construction projects in Rivers State Nigeria entails establishing relationships between the attributes of project quality and customer satisfaction in construction. If the need involved establishing the causal factors of such relationships, a qualitative research method would have been advised. This is because Collis and Hussey (2009) opine that interviews, an aspect of qualitative research methods answers questions regarding to 'why,' 'when,' and 'where'. Consequently, a quantitative research method is adopted as this would aid in establishing quantifiable relationships between project quality and customer satisfaction within road construction projects in Rivers State, Nigeria. Creswell (2009) further adds that a qualitative method could be adopted when there exists little or no information on the phenomenon being researched on but in this case, research on enhancing customer satisfaction in quantifiable measures have been carried out (Soetanto and Proverbs, 2001; Leung and Chung, 2004; Oyedele and Tham, 2007 and Nzekwe-Excel *et.al,* 2010). hence the choice of a quantitative research approach.

4.7.2 The research audience

The audience in a research involves both the participants and the beneficiaries of such a research. Consequently, the beneficiaries of this research includes government agencies involved with road construction projects, policy makers as well as organisations involved with government road construction, while the participants involve employees within the Rivers State ministry of works, employees of contracting firms involved with government road construction and stratified users of the finished road project. These categories of people who make up the audience are multidisciplinary in nature and may include Engineers, Architects, Surveyors, Project managers (Chinyio and Akintoye, 2008) amongst others and are usually involved with various types of construction projects. Collis and Hussey (2009) opine that qualitative research methods provide in- depth information usually obtained from few participants of a carefully selected sample. However road construction involves diverse professionals as opined by (Chinyio and Akintoye, 2008) and the more participants sampled, the greater the potential for generalisation of findings (Al Nahyan *et al.,* 2012). Hence employing a quantitative approach would ensure that a wide range of "the research audience" would be reached in the course of the research as against a qualitative approach which obtains in-depth information from a relatively few selected participants. The researchers' personal experience as well as available time needs to be considered.

4.7.3 Researchers' personal experience

The acquired wealth of knowledge and analytical skills of the researcher are also a determinant in the choice of research approach (Naoum, 2007). Whereas a quantitative approach would require statistical skills and the use of analytical software (Creswell, 2009), for example Structural Equation Modelling (SEM) or Statistical Package for Social Sciences (SPSS), a qualitative approach would require organizational skills associated with managing texts or verbal communication and the use of analytical software concerned with managing texts such as Nvivo (Creswell and Clark, 2007). In addition, a qualitative approach would involve adept knowledge on conducting interviews and making inferences based on spoken or observed communication, while a quantitative approach would require skills in managing numbers or figures or quantities and making inferences based on statistical calculations (Collis and Hussey, 2009). Consequently, the choice of a quantitative approach by the researcher seemed suitable considering the researchers' proficiency in managing data consisting of figures, numbers or quantities as well as proficiency in the use of SPSS for data

presentation and analysis. Creswell and Clark (2007) and Collis and Hussey (2009) opine that statistical skills and knowledge are essential for quantitative research. They state that quantitative research employs statistical methods to carry out descriptive and inferential numerical analysis on the data obtained. Hence having knowledge in statistics and its tools seemed to be advantageous to the researcher and an added reason to the adoption of a quantitative research method. However, despite the proficiency of the researcher in quantitative research methods, the available time and resources further influenced the adopted research approach.

4.7.4 Available time and resource

In order to carry out a research within a specified time frame such as a PhD, the adopted research approach is greatly influenced by the available time and the resources at the researchers' disposal. These resources may be financial, human or material or all, depending on the nature of the research (Creswell and Clark, 2007). Considering the fact that the research area was in Nigeria, time and financial resources were very essential in the plans that preceded the research process. Time considerations included travel time to and fro Nigeria from the UK without violating the UKBA regulations on Tier 4 student visas, time to contact participants, time to disseminate and retrieve surveys as well as time needed for data analysis and presentation of findings (Saunders *et al.,* 2009). According to Saunders *et al.,* (2009), scrutiny was needed in managing time and resources. Hence research required adequate planning and setting out as this could lead to quicker completion and predictable time frames. The consideration on resources however included travel expenses, preparation and pilot-testing of the survey tool, establishing relationships with organizational contacts, as well as logistics of retrieving survey from participants within the time frame allocated to data collection (Saunders *et al.,* 2009). Adopting the quantitative research approach afforded the researcher the desired flexibility to reach out to a wide range of participants within the relatively short time frame allocated to travelling to Nigeria. Contacts were established through phone calls and introductory letters accompanied by the survey. Although two trips to Nigeria were made between 2013 and 2014, both trips were articulated and planned to comply with the travel regulations as well as the time frame allocated to data collection and the quantitative research approach was a better choice to achieve such a research feat.

4.8 Adopted Research Design

A research design also known as a research strategy is defined as the *"general plan of how the researcher will go about answering the research questions"* (Saunders *et al.,* 2009:600). This general plan entails all the activities that would be carried out by the researcher in a bid to answer the research questions. According to Remenyi *et al.,* (2003), the research design/ strategy gives an overview of the various processes within a research. Just as the choice of a research approach required certain considerations, it was ascertained in Section 4.3 that the choice of a research design was dependent on the nature of the research questions, the philosophical underpins as well as the available time and resources at the researchers' disposal. Although various research designs with distinct characteristics exist, authors such as Saunders *et al.,* (2009) and Yin (2014) opine that the strategies are both interrelated and intertwined hence the most advantageous strategy for a particular study should be selected. Examples of common research strategies employed in business and management type research include experiment, survey, case study, action research, grounded theory, ethnography, archival research, cross sectional studies, longitudinal studies and participative enquiry (Easterby-Smith *et al.,* 2008; Collis and Hussey, 2009; Saunders *et al.,* 2009).

This research adopted a quantitative research approach which involved deductive logical reasoning. Furthermore the survey and correlational/regression research designs were adopted for data collection and the survey tool involved a comprehensive self- administered questionnaire. Table 4.3 provides a justification for the adopted research approach and design.

4.8.1 Justification of adopted research design

Table 4.3: Advantages of the adopted research approach and design

Advantages of the adopted research approach and design			
Quantitative	Deductive	Survey	Correlation/ Regression
Eliminates(minimizes) subjectivity of judgement	There is a well-established role for existing theory	This allows for high representativeness of the results obtained	These forms of analysis help to measure the strength of logistic relationship between variables.

Clearly and precisely specifying both the independent and the dependent variables under investigation	There is a logical relationship among concepts leading to concrete empirical evidence	Good statistical significance due to the high quantities of responses	Correlations can help compare any two variables regardless of their units
Achieving high levels of reliability of gathered data due to controlled observations, laboratory experiments, mass surveys	It allows for a more specific level of focus	High reliability due to little or no observer subjectivity	Regression has the advantage of predicting the relationship between two variables which are useful in forecasting.
Following firmly the original set of research goals, arriving at more objective conclusions, testing hypothesis, determining the issues of causality;	Conclusions follow logically from premises	Can be analyzed more objectively than other forms of research or data	

Source: (Easterby-Smith *et al.*, 2008; Collis and Hussey, 2009; Saunders *et al.*, 2009).

In any research, it is essential to provide clear and succinct explanations on the choices made while carrying out a research (Crotty, 1998). These in-depth explanations that influence decisions make up the justification for such a decision. The justification of the adopted research design is based on the nature of the research questions, the philosophical underpins as well as the time frame and resources at the researchers' disposal.

4.8.1.1 Nature of the research questions

The choice of a quantitative research design was greatly influenced by the nature of the research questions. The questions largely dwelt on knowing the extent of relationship between the attributes of project quality and customer satisfaction while handling government road construction projects in Rivers State, Nigeria. Collis and Hussey (2009) highlight the relevance of a quantitative research to the establishing of relationships as well as confirming (or disconfirming) what has been outlined through the conceptual framework. They suggest

that the quantitative research design is most suitable when the need arose to answer questions bothering on “how much”, “how many” or “to what extent”. Perhaps, if the intention of the research was to know causal factors that explain the relationship between the attributes of project quality and customer satisfaction within road construction projects, the adopted quantitative design would have been least appropriate.

4.8.1.2 The Philosophical underpin

Another key determinant of the choice of a quantitative research method was the philosophical stance adopted. A Positivist philosophical stand was adopted for this research basically due to the characteristics and assumptions entailed in the positivist stance. Positivists believe that there exists only one objective social reality which is not usually affected by the form of investigation employed (Collis and Hussey, 2009). In addition, knowledge from a positivist perspective is obtained from information in a mathematical format (figures) which can be subjected to statistical analysis for verification (Collis and Hussey, 2009). Furthermore, ontologically, positivists believe that the researcher has no influence on the nature of the single objective social reality and are thus detached from the data collection processes involved with the research. Similarly, epistemologically, positivists are inclined to accepting only phenomena that are observable, measurable and quantifiable as knowledge. These characteristics are different in the qualitative research approach which hold that the researcher should be embedded in the data collection process as well as what is being researched (Eriksson and Kovalainen, 2008; Collis and Hussey, 2009).

4.8.1.3 Time frame and resources

Due to the strict time frame for this research and the limited resources available to the researcher, a quantitative research approach was deemed suitable for the research. Adopting a qualitative research approach would have involved the researcher staying and fully participating in the data collection process for example conducting interviews. However, the quantitative approach gave the researcher the flexibility to prepare and pilot test the survey tool, questionnaires in this case, and spend minimal time in administering and retrieving the questionnaires. In addition, the resources to contact, visit and conduct interviews with participants would have been a daunting task for the researcher considering the limited time and resources. Adopting a positivist philosophical stance and a quantitative research approach aided the researcher to still obtain valuable information from a very large sample (503

respondents) within a relatively short period of time when compared to the qualitative approach. Collis and Hussey (2009) however identify the relatively short time to collect data from a large sample as one of the strengths of quantitative research methods although they admit that the volume of information obtained from qualitative means even though from a relatively smaller sample cannot be compared to that obtained when employing the quantitative research approach.

4.8.2 Strength and Weakness of the quantitative research approach

The adoption of a quantitative research approach was seen as the best choice considering the nature of the research questions, the adopted philosophical stance as well as the available time and resources at the researchers' disposal. However, Saunders *et al.*, (2009) and Yin (2014) note that each research method possessed distinct characteristics even though they were related and suggests that the most advantageous strategy is usually the most suitable. Consequently the strengths and weaknesses of a quantitative research are highlighted in table 4.4 below.

Table 4.4: Strength and Weakness of the quantitative research approach

Strengths	Weaknesses
Involves testing and validating already existing theories.	Provides general knowledge which may not be applicable to specific situations or contexts.
Hypothesis (in this case research questions) are constructed before data collection.	Presence of confirmation bias as vital information may never be known since the research involves testing a theory or hypothesis rather than creating a theory or hypothesis.
Possibility of generalization of findings especially when data obtained is based on a sample of sufficient size.	The context of the study is often ignored as the research turns to statistics to obtain results and research findings.
Predictions can be made based on quantitative data obtained.	Research is not carried out in a natural setting as certain phenomena may have different meaning to different people.
Generalisations can be made when research has been replicated on different and diverse populations.	

Data analysis is less time consuming (use of statistical software).	
Data collection using quantitative methods is relatively quick (e.g. using questionnaires).	
Useful when establishing valid relationships between variables.	
Essential when studying large and sometimes unknown sample sizes. The larger the sample, the more statistically accurate the results are.	
Possesses statistical significance as the researcher is independent of the research results	

Adopted from (Collis and Hussey, 2009; Saunders *et al.*, 2009; Yin, 2014).

4.8.3 Strategies in quantitative research

In a quantitative research, there exist different strategies that can be employed to obtain data for analysis. These strategies have their uniqueness, strengths and weaknesses and depending on the type of research, the most advantageous is often selected. According to Saunders *et al.*, (2009), the various strategies utilized in quantitative research includes **surveys** which may include custom surveys, mail/e-mail/Internet surveys, telephone surveys, self- administered questionnaire surveys or omnibus surveys. For purposes of obtaining information that would lead to establishing the relationship between project quality and customer satisfaction within Government road construction projects in Nigeria, the survey using self- administered questionnaire was adopted. The justification for the choice of survey research strategy will be offered accordingly.

4.8.4 Survey in a quantitative research

Surveys are viewed as the most common type of strategy in a quantitative research whereby information is obtained by asking questions. In carrying out surveys, there has to be a careful selection of a relatively small but statistically valid sample from a considerably larger population. Contrary to popular opinion, surveys could be of diverse formats which may include a self- administered written document with blank spaces to be written on, an online questionnaire which may be emailed or uploaded to a link, or a checklist that requires yes- or- no answers (Creswell and Clarke, 2007). Other forms of a survey may include face- to- face

interviews or telephone interviews. A survey however could be referred to as a scale while the questions or statements in the survey are referred to as items (Creswell and Clarke, 2007). According to Congdom and Dunham (1999), surveys could be used to obtain data from large or small populations. For example, focus group interviews can obtain in-depth information from small groups of about 5- 8 people whereas online questionnaires can obtain information from hundreds of people. Indeed the choice of a survey type depends on what the research aims to achieve. Surveys in research may either be cross sectional or longitudinal.

4.8.4.1 Cross Sectional Surveys

This refers to surveys that are carried out at a particular instant and inform the researcher on the nature of a phenomenon at a particular time. According to Mathers, Fox and Hunn (2007), cross sectional surveys are usually descriptive or exploratory describing behaviours or attitudes towards the issue being researched.

4.8.4.2 Longitudinal surveys

Longitudinal surveys on the other hand are employed to provide insights on the phenomenon being researched over a period of time. Mathers, Fox and Hunn (2007) add that the time frame may be months or even years. Longitudinal surveys may be in a cohort format where the same groups of individuals are observed over a long period of time, or trend format which involves a repetition of the survey on different people over the same period of time. This research adopts the cross sectional survey format, where the relationship between project quality and customer satisfaction is desired at any instant, rather than over a period of time, while carrying out government road construction projects. Mathers, Fox and Hunn (2007) opine that cross sectional studies are used when the purpose of the study was descriptive and the aim involved describing (in this case by quantitative means) the happenings within a population at a particular time. In addition, as earlier admitted, the issue of customer satisfaction in construction has been researched on (Torbica and Stroh, 2000; Johnson *et al*., 2002; Yang and Peng, 2008; Chi and Gursoy, 2009; Xiong *et al.*, 2014; Okoye *et.al.*, 2015) and the adopted cross sectional survey format is in agreement with the survey formats employed in these research albeit different survey tools, for example, face-to-face interviews, mail or telephone questionnaires (Creswell and Clarke, 2007). Questionnaires were however employed as the survey tool and the reasons behind such a choice are presented below.

4.8.5 Questionnaire survey

A questionnaire is defined as a simple tool for collecting and recording information about a particular problem of importance (Saunders *et al.*, 2003; 2009). Questionnaires in research are basically administered to a sample of respondents in order to yield responses that could provide answers to the research problem. Questionnaires entail a list of questions usually generated from literature and the conceptual framework, all geared at obtaining information that could lead to knowledge. According to Saunders *et al.,* (2009) questionnaires are strongly linked to the research questions and should contain information on instructions, the objectives of the research as well as the relevance of the research to the respondent. Qualitatively, questionnaires could be referred to as interview schedules where the interviewer asks a standard set of questions and records the responses. This type of questionnaire is often face-to-face or over the telephone. Conversely, structured questionnaires which are frequently employed in quantitative research involve numbers or some sort of figures and inferences are made from subjecting the figures to statistical tests. This type of questionnaire may also be face- to- face, postal or electronic and the respondents complete the questionnaires in their own time, independent of the presence of the researcher (Saunders *et al.,* 2009). Table 4.5 presents the advantages and disadvantages of using a questionnaire survey in research.

Table 4.5: Advantages and disadvantages of using a questionnaire survey in research.

Advantages	Disadvantages
Cost effectiveness as large amounts of information can be obtained from a large number of respondents in a short period of time	Cannot be used to measure information relating to emotions, feelings or behaviours.
It is a very practical way of doing research	Responses could be deficient in validity.
Analytical methods are scientific rather than objective	Honesty of the respondent cannot be verified.
Comparisons can be made when data has been quantified.	Scrutiny in the thought process of the respondent is absent.
Ease of analysis usually using a software or elementary statistics	Questions are answered based on the respondent's interpretation of the question which may differ from the researchers'

	intentions.
Research findings are void of researcher bias through personal interpretation of results.	The researcher decides what should be on the questionnaire and may omit some vital information.

Source: Saunders *et al.*, (2009).

The advantages therein are in tandem with the chosen positivist philosophical stance which entails measuring and quantifying social phenomena independent of the influence of the researcher (Creswell, 2009; Collis and Hussey, 2009). Hence the use of questionnaires as a tool for the cross sectional survey designed for this research. Consequently, specifying the respondents of the questionnaire survey is provided by ways of sampling from the available sampling techniques.

4.9 Sampling and Sample Techniques

When carrying out a research, it may be practically impossible to reach out to everybody to either interview or distribute questionnaires. Reaching out to any and every person may be time consuming, expensive and a waste of resources on people who may not possess vital information on the subject matter. Hence it is expedient that participants in a research are carefully selected in a manner that only relevant information may be obtained and such information can be up-scaled or generalized. Descombe (2010) defines a sample as a group of people who take part in a research investigation. Collis and Hussey (2009) also define a sample as a collection of individuals who are able to represent the entire population of people involved within a research. The people chosen to take part in the research are usually referred to as participants or respondents and the act of selecting these participants is known as sampling. In addition, the population refers to the larger group of people from where the sample was obtained which implies that a sample is a subset of and a representation of the population (Collis and Hussey, 2009; McLeod, 2014). Sampling techniques on the other hand refers to the different methods employed to select participants that make up a sample from a larger population. Basically, there are three major types of sampling techniques employed in research which are the probability, non- probability and the No- rule sampling techniques and would be discussed in section 4.9.3.

4.9.1 Reasons for sampling

In a research it is quite essential to sample respondents as the advantages therein are enormous both to the researcher and the nature of the research findings. The main reasons for sampling as obtained from literature according to Naoum (2007); Bryman (2008) and Collis and Hussey (2009) include;

a. Sampling ensures that the right respondents are selected for the survey in particular or the research in general.
b. Sampling enables conclusions to be arrived at concerning a larger population through studying a smaller portion (sample).
c. Sampling is cost and time effective as it is cheaper to study or observe a sample rather than the entire population, thereby taking a relatively short time.

4.9.2 Errors associated with sampling

Owing to the fact that sample sizes are a representation of the population, improper sampling may distort the nature of findings. According to Barreiro and Albandoz (2001) and Bryman (2008), errors from samples may emanate from the interviewer being partial in questioning, or from the participant ignoring or refusing to provide certain information. Two types of errors associated with sampling exist and they are Selection error and Non- answer error.

4.9.2.1 Selection Error

This type of error occurs when one or part of the sample has a higher probability of being selected and thus is not a true representation of the entire population. For example, if a research needed to know how many students borrowed books in the library and students were to be surveyed between 10am and 12 noon, the sample selected may not be a true representation of the entire population of students who use the library. A common mitigation procedure would be to select a sample that would give all the respondents an equal probability of being selected (Descombe, 2010).

4.9.2.2 Non- Answer error

This type of error occurs when respondents in the sample refuse to answer certain questions either due to the confidentiality of the information sought, or lack of understanding of the question. This error is also visible when respondents are not sincere in their responses, although it is quite challenging to avoid such occurrences (Descombe 2010). Mitigation of the sincerity concerns of samples would be to include “filter” questions to serve as a check

for accuracy in responses. For example, the sincerity of a response could be questioned if a respondent claims to have above 20 years of working experience in the construction industry but falls within the 25 to 30 years age bracket.

4.9.3 Sampling techniques

In order to ensure the avoidance of sampling errors and biases in research, three distinct sampling techniques were identified. They include the probability, non- probability and No-rule sampling techniques.

4.9.3.1 Probability sampling

In probability sampling, each and every component that makes up the population has an equal opportunity of being selected to become a part of the sample (Collis and Hussey, 2009). Different methods are applied to the population to select a sample that is known to the researcher prior to data collection. These methods include the Simple Random Sampling (SRS), the Stratified Sampling, the Systematic Sampling as well as the Cluster Sampling methods.

Figure 4.1 shows the different techniques utilized in probability sampling although it is noted that in any sampling technique, reducing the sampling error is vital to the validity of the research findings (Denscombe, 2007; Collis and Hussey, 2009). Therefore, a sample size should be indicative of the population, should be large enough to adequately provide answers that can be generalized to the entire population to answer the research questions, but should not be too large to be unreasonable and uneconomical (Collis and Hussey, 2009).

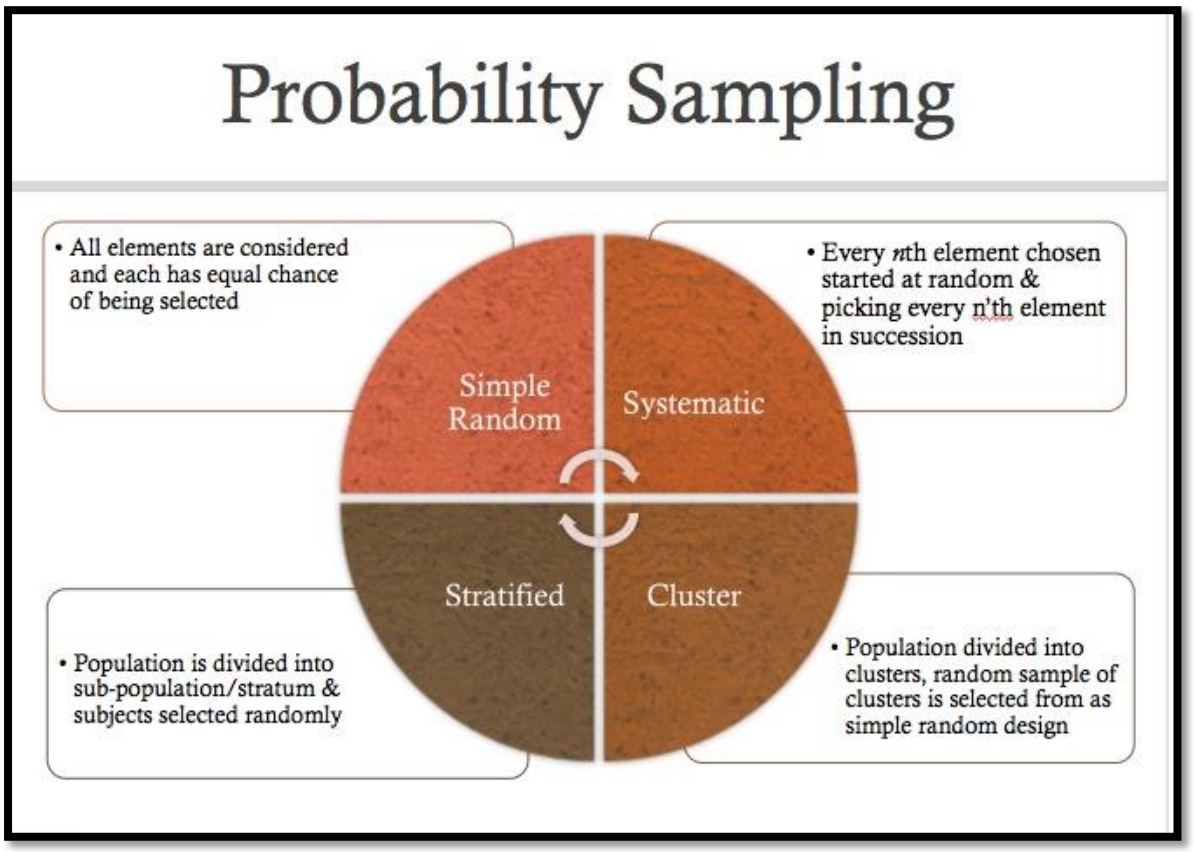


Figure 4.1: Methods of Probability sampling technique

Source: Summarised from Denscombe, (2007) and Google Images, (2015).

4.9.3.2 Non- Probability Sampling

Non probability sampling entails an infinite or unknown population and thus an unknown sample size. According to Denscombe (2007), the sample in non- probability sampling is selected based on relevance, availability and significance, and the members of the population do not have an equal chance of being selected. Consequently, Creswell (2009) opines that the larger the sample selected the more valid the findings would be. Tabachnick and Fidell, (2007) posit that when the population in a research is unknown, using a sample size of 100 is poor, 200 is fair, 300 is good, 500 is very good while 1000 participants is excellent. Creswell (2009) further decries the challenges involved with generalisations when using non-probability sampling adding that the available sample may not be a true representation of the entire population being researched on. The different methods employed in non- probability sampling includes Convenience, Judgmental, Quota and Snowball methods. Figure 4.2 also shows the different methods of non- probability sampling as well as their characteristics.

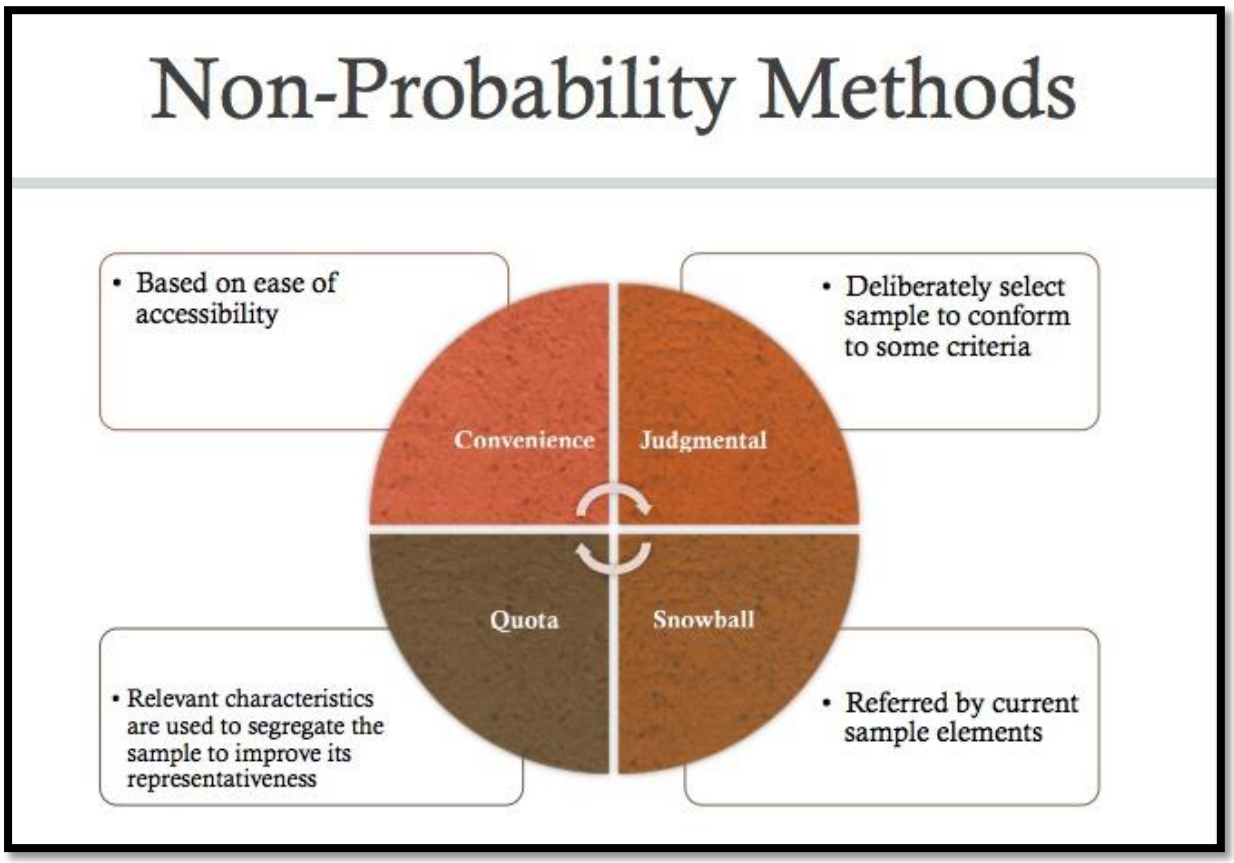


Figure 4.2: Methods of Non- Probability sampling technique

Source: Summarised from Denscombe, (2007) and Google Images, (2015).

4.9.3.3 Sampling Techniques: Advantages and Disadvantages

The choice of a sampling technique largely depends on the nature of the research questions and the availability of resources for the research. Whereas each method has its uniqueness and relevance, the researcher is enjoined to identify which sampling technique best suits his/ her research and obtain valid justifications for any choices made. In addition, both the methods in the probability and non- probability sampling techniques have their unique advantages and disadvantages. These are summarized in the table below and the table also highlights when such a technique should be used. Creswell (2009) however admits that in practice, the characteristics of the various sampling methods are interlinked. Table 4.6 shows the merits and demerits of the available sampling techniques as this would inform the adoption of a technique for this research.

Table 4.6: Advantages and disadvantages of various sampling techniques

Technique	Descriptions	Advantages	Disadvantages
Simple random	Random sample from whole population	Highly representative if all subjects participate; the ideal	Not possible without complete list of population members; potentially uneconomical to achieve; can be disruptive to isolate members from a group; time-scale may be too long, data/sample could change
Stratified random	Random sample from identifiable groups (strata), subgroups, etc.	Can ensure that specific groups are represented, even proportionally, in the sample(s) (e.g., by gender), by selecting individuals from strata list	More complex, requires greater effort than simple random; strata must be carefully defined
Cluster	Random samples of successive clusters of subjects (e.g., by institution) until small groups are chosen as units	Possible to select randomly when no single list of population members exists, but local lists do; data collected on groups may avoid introduction of confounding by isolating members	Clusters in a level must be equivalent and some natural ones are not for essential characteristics (e.g., geographic: numbers equal, but unemployment rates differ)
Stage	Combination of cluster (randomly selecting clusters) and random or stratified random sampling of individuals	Can make up probability sample by random at stages and within groups; possible to select random sample when population lists are very localized	Complex, combines limitations of cluster and stratified random sampling
Judgemental/ Purposive	Hand-pick subjects on the basis of specific characteristics	Ensures balance of group sizes when multiple groups are to be selected	Samples are not easily defensible as being representative of populations due to potential subjectivity of researcher
Quota	Select individuals as they come to	Ensures selection of adequate numbers of	Not possible to prove that the sample is

	fill a quota by characteristics proportional to populations	subjects with appropriate characteristics	representative of designated population
Snowball	Subjects with desired traits or characteristics give names of further appropriate subjects	Possible to include members of groups where no lists or identifiable clusters even exist (e.g., drug abusers, criminals)	No way of knowing whether the sample is representative of the population
Convenience/ volunteer/ accidental.	Either asking for volunteers, or the consequence of not all those selected finally participating, or a set of subjects who just happen to be available	Inexpensive way of ensuring sufficient numbers of a study	Can be highly unrepresentative

(Source: Black 1999: 118).

4.9.4 Adopted Sampling technique

Consequent to the advantages and disadvantages of the various sampling techniques, and in line with the research aim, the preferred and hence adopted sampling technique was the Non-probability sampling technique. A combination of Convenience, Judgemental and snowballing methods were however employed to make up the sample for this research. The population for the research on enhancing project quality and customer satisfaction in government road construction projects in Rivers State, Nigeria consisted of employees of the Rivers State ministry of works (those involved with road construction projects), employees of registered construction firms handling road construction jobs in Port Harcourt, the state capital as well as road users with sufficient knowledge on road construction. These sets of people were chosen chiefly because they seemed to have the capability to provide vital information that would provide answers to the research questions. The identified population also makes up a large percentage of the stakeholders involved in road construction projects, hence ensuring a burning desire for participation of the participants. The inability to arrive at

a particular figure for the research population expressly influenced the adoption of non-probability sampling techniques for this research (Tabachnick, and Fidell, 2007). Employing convenience, judgemental and snowballing methods, the respondents were selected using certain criteria such as level of employment (for workers in the Ministry of works) years of experience and number of road construction project handled during the respondents career amongst others. In the course of consultation, it was initially planned to identify construction firms involved in road construction from the Corporate Affairs Commission (CAC) and the Rivers State Ministry of Works. However, due to bureaucracy and confidentiality, the comprehensive list of registered companies involved in government road construction projects, which should have aided in arriving at the population, could not be obtained. This further influenced the choice of non- probability sampling techniques for the research. Convenience, judgemental and snowballing methods were however employed in making up the sample for the research. Consequently, out of the 600 questionnaires distributed, 518 respondents participated in the survey and 503 of the retrieved questionnaires were valid for analysis. This consisted of people classified as the government body, contractors, customers (users) and funding bodies. The major setback in the choice of sampling technique employed remains the challenge of generalisation (Table 4.6) hence the research was limited to the geographical scope.

4.10 Ethical considerations

In every research especially one involving human participants, it is essential to ensure the safety and protection of both the respondents and the researcher. Ethical considerations offer the researcher the platform to ensure confidence and trust within respondents, ensure confidentiality of information and uphold the quality of the findings from the research (Bryman, 2003; Creswell, 2009). In line with the ethical considerations from the University of Wolverhampton, an ethical approval is required of every researcher carrying out a research as a student. This is intended to acquaint the university authorities on the nature of the research being carried out, to ensure that participants are fully aware of their statutory rights while engaging in a research, and avoid any legal issues that may arise which may be health and safety related or pertaining to intellectual property rights. Consequently, an approval was sought by the researcher from the School of Technology Ethics Committee and the approval granted was of the A1 category. This implied that the research did not have the potential to put either the researcher or the respondents at risk and the confidentiality of the responses

could be guaranteed in the course of the research. An introductory letter was then drafted which introduced the research to participants and needed their signature as consent to participate in the research (See Appendix).

4.11 Data Collection and analysis

Data in research is seen as an acronym for information. Data collection thus refers to the process of obtaining, collating and measuring information on particular variables which are of interest to the researcher (Saunders *et al.,* 2009; Yin 2014). Irrespective of the research strategy adopted (quantitative, qualitative or mixed), the validity of data obtained is essential. According to Saunders *et al.,* (2009), there are various methods of data collection which include Interviews, Questionnaires and surveys, Observations, Focus groups, Ethnographies, Oral history, Case Studies, Documentation and Records. Saunders *et al.,* (2009) however opine that while the methods of data collection may vary, the need to ensure accuracy, validity and reliability of data obtained in the various methods is the same. There exist two distinct sources of data utilized in research and they Primary and Secondary data sources.

4.11.1 Primary data

This refers to data obtained for specific purposes relating the research (Yin, 2014). Data of this nature are directed at a particular aim and aid in providing answers to the research questions. While obtaining primary data, the researcher employs methods such as direct observations, interviews or even surveys to personally collect data. Primary data sources are usually needed when such a research has not been carried out previously and new knowledge in the particular area is sought. Primary data are original, unique and exclusive to the researcher and give a realistic view of the issue being researched. The primary data in this research involved the responses from both the questionnaire survey carried out and the excerpts from the accompanying interviews. While the quantitative data was coded by means of the statistical software SPSS and subjected to statistical analysis for interpretation, the qualitative data was subjected to thematisation and categorisation. Inferences were then drawn from the findings.

4.11.2 Secondary data

This refers to already existing data which is somehow related to the issue being researched. This type of data is almost always available and less expensive to obtain. Saunders *et al.,*

(2009) posit that secondary data sources are usually employed to gain insights into the nature of the research problem and are mainly used in the literature review section of any research. Typical sources of secondary data include previous research (academic and otherwise), statistical records, mass media, Government reports, the internet as well as historical data. For purposes of this research, secondary sources of information included journal articles, relevant and recent text books, the internet, past published and unpublished Ph.D. theses amongst others.

4.11.3 Types of data

The type of data sought after is usually grouped into two types which are Categorical and Numerical data (Creswell and Clarke, 2007; Creswell).

4.11.3.1 Categorical data

Categorical data is a type of statistical data that comprises of categorical variables obtained from either quantitative or qualitative data. Categorical data obtained from quantitative means involve observed counts or values occurring within intervals such as yes/ no type of counts. Typical examples of categorical data include gender and marital status, which are single numbers but have no mathematical meaning as they can neither be subtracted nor added (Creswell and Clarke, 2007). Considering qualitative data sources for categorical data, observations are converted to quantitative data through coding and recording counts. Values deduced from the qualitative data are converted into figures by means of developed codes. Categorical variables which are a qualitative method of scoring data must be converted into quantitative data in order to be able to analyse the data statistically (Creswell and Clarke, 2007).

4.11.3.2 Numerical data

This includes measurable values or numbers which have meaning of their own (Creswell, (2009). Typical examples include height, weight or even age. Numerical data could also be discrete where the possible outcomes are fixed and finite and can be counted or continuous where the possible values can only be described using intervals on a number line.

Categorical data can also be subdivided into Nominal, Ordinal, Interval and Ratio data (Saunders *et al.*, 2009).

4.11.3.3 Nominal data

This refers to a type of categorical data where variables are mutually exclusive to each other. Coding variables and running statistical tests makes no difference. Also, the order and difference between the variables is irrelevant and not of interest to research. Examples include genotype or marital status.

4.11.3.4 Ordinal data

A data set is said to be ordinal if there exists an order in the variables which is of relevance to the data collector but the difference between the variables is not represented by the ordered response. In other words, ordinal data can be counted and ordered but the order is not a representation of the difference between the orders. For example a satisfaction rating of 1-5 indicating highly dissatisfied, dissatisfied, neutral, satisfied and highly satisfied would imply that a rating of 5 (highly satisfied) would be higher than 4 (satisfied). However, that is all the information provided by the rating as the rating does not inform the researcher how much difference exists between highly satisfied and satisfied.

4.11.3.5 Interval data

This type of data involves ordered data whereby the differences between variables are equally split. Interval type data have the same distance between two adjacent units of measurement but possess an arbitrary zero point. Examples include the temperature scales or difference in days of the week.

4.11.3.6 Ratio data

Ratio data refers to data that is ordered, the difference between the variables is equally split and the data possesses a zero- origin (0, 0) point. Main examples include height, age and weight as they all have a zero origin.

The data collection procedure for the research on enhancing project quality and customer satisfaction within government road construction projects in Nigeria employs the use of Likert scales to rate responses of respondents. The ratings include 1 for strongly disagree, 2 for disagree, 3 for indifferent, 4 for agree, and 5 for strongly agree as well as 1 for highly dissatisfied, 2 for dissatisfied, 3 for indifferent, 4 for satisfied and 5 for highly satisfied. Owing to the fact that the difference between the scales employed is only an indication of the preference rather than the extent of difference, this research generates ordinal data. Consequently analysis of the data obtained involved parametric tests relating to means and

standard deviations, as the distribution of parameters for the data are assumed. In addition, parametric tests in research such as analysis of variance (ANOVA) were employed to compare variables as well as Correlation and Regression to study the relationships between variables (Saunders *et al.,* 2009). The details of the parametric tests are given in chapter 5.

4.11.4 Questionnaire design

Oppenheim, (1992) posits that data collection in a research could be an exciting experience made even easier through the use of questionnaires but the design of the questionnaire could transform the entire experience into a nightmare. Similarly, Creswell (2009) opines that weaknesses in questionnaire design are usually not visible until the need to analyse and interpret results arises. Hence the design of questionnaires is very essential to the quality of research findings as issues such as clarity and focus on the research aim remain challenging. Designing the questionnaire for this study the researcher commenced with familiarizing himself with the aim and objectives of the study. A review of relevant literature was also attempted followed by conceptualizing the study through a conceptual framework and outlining possible questions that would aid in providing answers to the research questions. Also previous questionnaires utilized in construction management research were also understudied and final conclusions on the nature of the questionnaire for this research was arrived at. Subsequent to the numerous iterations of the questionnaire between the researcher and the supervisory team as well as the feedback from pilot- testing the survey tool, the final questionnaire was developed and was divided into three parts, Sections A, B and C (Refer to Appendix 10).

Section A was subdivided into A1 and A2 and these captured the demographics of the respondent. Also section A was geared at ensuring that the respondents possessed relevant knowledge on road construction projects and had been involved in similar road construction activities during their career. Section B captured the attributes of project quality regarding government road construction projects. The questions in this section were drawn from the literature review and geared at obtaining information on the respondents' perception of the attributes of project quality. Section B was further sub- divided into B1, B2 and B3 representing questions on Project performance, Reliability and Aesthetics respectively within government road construction projects. Section C involved questions drawn from literature on customer satisfaction in construction. Two metrics namely contractor referral and contractor re-patronage were used to ascertain customer satisfaction in construction. Section

C1 entailed questions on contactor re- patronage, while C2 entailed questions on contractor referral. In summary, 103 questions were asked which took between 30- 35 minutes to answer. Closed ended questions were asked and the respondents were enjoined to indicate their response on the Likert scale provided. The questions were structured in a manner that the idea of the respondent is represented rather than the idea of the researcher. This was achieved through the various iterations between the researcher and the supervisory team as well as the findings from the pilot study.

4.11.5 Pilot Study

Pilot studies are a vital part of a good research design as they provide advance warnings on problematic areas within the research as well as the feasibility of the adopted research methods or instruments. Also referred to as mini versions of a main study, the pilot study entails pre-testing of a particular research instrument and thus re-instates the words of De Vaus (1993:54), "*Do not take the risk. Pilot test first.*" According to Teijlingen van *et al.,* (2001), Creswell and Clark, (2007) and Saunders *et al.,* (2012), the key aim of carrying out a pilot study includes;

- Developing and testing adequacy of research instruments
- Assessing the feasibility of a (full-scale) study/survey
- Designing a research protocol
- Assessing whether the research protocol is realistic and workable
- Establishing whether the sampling frame and technique are effective
- Assessing the likely success of proposed recruitment approaches
- Identifying logistical problems which might occur using proposed methods
- Estimating variability in outcomes to help determining sample size
- Collecting preliminary data
- Determining what resources (finance, staff) are needed for a planned study
- Assessing the proposed data analysis techniques to uncover potential problems
- Developing a research question and research plan
- Convincing funding bodies that the main study is feasible and worth funding
- Convincing other stakeholders that the main study is worth supporting

Consequently, 50 copies of the proposed questionnaire were distributed to respondents consisting mainly of PhD students and post-graduate students within the Faculty of Science and Engineering of the University of Wolverhampton, U.K. Within the allocated time frame of 7 days, 16 questionnaires were returned indicating a response rate of 32%. The following were the findings/observations.

1. Consistency in punctuation, and formatting.
2. Error in the Likert scale; 1 should be for strongly disagree, 2 for disagree, 3 for indifferent, 4 for agree and 5 for strongly agree.
3. Questions 43- 53 needed to be restructured to bring out its clear meaning.
4. A clear distinction should be made on the type of roads this questionnaire and the research addresses. A section should be introduced to bring out the characteristics of the road under review (rural/ urban road, dimension, financial involvement, type of road finishing, etc.). Respondents thought that if they considered different road construction projects they had been involved with; their responses would be different, hence introducing bias in responses.
5. On the average, it took 31 minutes to complete the questionnaire.
6. Questions 16, 19, 45, 52, 71, 74, 78, 88, 89, 101, were a bit confusing for the respondents.
7. The Likert scale should be highlighted on each page to remind the respondent on the scaling.

Appropriate attention was given to the observations which included re-wording, re-structuring and in some cases, total elimination of the question due to its duplication or irrelevance. The pilot test went on to find out specifics on the nature of the questions asked and the findings are presented in Table 4.7. The table shows the mean and standard deviations of the responses based on the content of the questionnaire.

Table 4.7: Descriptive Statistics on pilot study questionnaire.

	N	Minimum	Maximum	Mean	Std. Deviation
Time to complete questionnaire (Minutes)	16	25	38	31.50	9.1924
Ease of questionnaire	16	3	5	3.50	0.6320
How respondents consider the questionnaire	16	2	5	3.44	0.7270
Presence of difficult questions	16	0	1	0.75	0.4770
Questions to be changed	15	0	1	0.47	0.5160
Valid N (listwise)	15				

The data was further subjected to statistical analysis and the following conclusions were arrived at.

1. Section A (demographics) was analysed using frequency and percentages.

2. The considerations for research questions 1 and 2 were addressed through mean ratings and decision tables. Other aspects of RQ2 were addressed using step-wise regression analysis presented in the Model Summary. The R and R^2 values which indicated the degree of correlation and how much of the total variation in the independent variable (Project quality) could be explained by the dependent variable (Customer satisfaction) respectively were generated in the Model Summary. In addition, knowledge on the significance of the dependent variables was obtained from the regression coefficients table highlighting the unstandardized and standardised coefficients as well as the beta (β) values. The β- value could either be negative or positive, and possess a t- value with associated significance. These values aided in obtaining the regression equations and specify how much increase in the dependent variable can be obtained by a unit increase in the independent variable.

3. The relationships outlined by research question 3 were obtained from the regression equations from the regression coefficients table and the regression analysis of variance (ANOVA).

4. Percentage contributions of the independent variable on the dependent variable were obtained on the basis of the adjusted R^2 values.

4.11.6 Implications of the pilot study

The pilot study gave an insight into the nature of findings expected in the main study. Carrying out the pilot study aided in refining the questionnaire survey while ensuring clarity and objectivity of the questionnaire items. Double-barrelled questions were eliminated, the instructions for the respondents especially in terms of the Likert scales were corrected. Without the pilot study, these issues would have distorted the validity of responses obtained. In addition, a test run of the data analysis informed the researcher on the appropriateness of the analytical tools employed such as ANOVA, correlation and multiple regression. The number of questionnaire items (103) and the nature of the response rate (32% in 7days) informed the researcher on the importance of time with respect to retrieving questionnaires. This was incorporated into the main study as adequate time, follow up and reminders were sent to the respondents to ensure completion and consequent retrieval of the questionnaires. This strategy was however evidenced in the high response rate recorded in the main study, 86%. Sequel to the identification and mitigation of possible issues associated with this research through the pilot study, the main study proceeded.

4.11.7 Main Study:

This study employed the use of quantitative surveys for data collection (See appendix 10). Questionnaires were self- administered and statistical techniques were utilised to establish relationships between the dependent and independent variables. For consistency, respondents were selected based on criteria such as years of experience in road construction, projects handled as well as type of road project involved in. 600 questionnaires were distributed, 518 of which were retrieved, indicating a response rate of approximately 86%. Comrey and Lee (1992) suggest that a sample of 100 is poor, 300 sufficient and 1000 excellent. Similarly, Tabachnick and Fidell (2007) posit that when the population in a research is unknown, using a sample size of 100 is poor, 200 is fair, 300 is good, 500 is very good while 1000 participants is excellent. Creswell (2009) further adds that the larger the sample size, the more valid the findings are expected to be, hence having a sample of 518 was "*very good*" for this research.

Indeed there is no consensus on the number of points to be used on a Likert scale. However, 5 point Likert scales are encouraged even though other authors suggest 7 or even 9 point scales (Jamieson, 2004; Allen and Seaman, 2007 and Carifio and Perla, 2008). According to Jamieson (2004), Allen and Seaman (2007) and Carifio and Perla (2008), there are no right or

wrong answers within a scale as long as each individual item measures something that can be measured quantitatively. They opine that each item in a Likert scale should represent a statement that a respondent can give their opinion on and this informed the choice of a 5-point Likert scale for this study. Key attributes of project quality and customer satisfaction in construction were extracted and adopted from existing literature (Mbuga *et al.,* 1999; Torbica and Stroh, 2000; Aibinu and Jagboro 2002; Johnson *et al*., 2002; Yang and Peng, 2008; Zu *et al.,* 2008; Chi and Gursoy 2009; Olatunji and Diugwu 2013; Xiong *et al.,* 2014; Okoye *et.al.,* 2015). Consequently, respondents were encouraged to rate their opinions on the issues relating to project performance (Section B1), project reliability (Section B2) and Project aesthetics (Section B3). In addition, questions bothering on contractor referral and re-patronage were covered in sections C1 and C2 respectively (See Appendix). Participants were asked how satisfied they were with road construction activities within Government construction projects in Nigeria and their responses ranged from 1 for highly unsatisfied to 5 for highly satisfied. Tables 5.1- 5.7 give an indication of the responses from the participants where "*Dominant*" indicated the category with the highest frequency of responses, asterisk "*" and "#" represented the decision of the responses on a particular item indicating agreement or disagreement and satisfaction and dissatisfaction respectively. Consequently, the choices for the research methodology are presented in Table 4.8 with reference to the sections within the chapter.

Table 4.8: Summary of Research Methodology Chapter.

Level of decision	Choice for the specific research setting and considerations	Chapter section	References
Research topic	A Framework For Improving Project Quality And Customer Satisfaction In Government Road Construction Projects In Rivers State, Nigeria.		
Research strategy/ style	**Exploratory and Explanatory employing Cross sectional survey.**	4.2	Onwuegbuzi and Johnson (2004); Saunders *et al.*, (2009)
Philosophical stand	**Positivism**: Assumption that there exists only one objective social reality.	4.3.2 and 4.3.2.1	Collis and Hussey (2009)
Research design	**Survey and correlational/regression research designs:** Research objectives, level of existing knowledge on PQ and CS, Philosophical paradigms, and time frame allocated to research.	4.3 and 4.8	Remenyi *et al.*, (2003); Saunders *et al.*, (2009).
Research approach	**Deductive:** Considered the research problem, the research audience, the researcher's personal experience and available time and resources.	4.5.1	Chinyio and Akintoye (2008), Creswell and Clark (2007).
Research method	**Quantitative**: a. Self-administered questionnaires b. Structured interviews. **Qualitative:** For framework validation. (b).	4.6	Collis and Hussey (2009) and Creswell (2009).
Population	Employees of the RV MOW, registered construction firms and users with sufficient knowledge on road construction.		
Sampling technique	**Non- probability sampling:**	4.9.3.2	Denscombe (2007) Tabachnick and Fidell, (2007)
Sampling method	A combination of **Convenience, Judgemental** and **snowballing methods**	4.9.3	Denscombe (2007); Collis and Hussey (2009).
Ethical approval	**Approved A1 Category** School of Technology Ethics Committee, University of Wolverhampton, U.K.	4.10	Bryman (2003); Creswell (2009).
Type of data	**Ordinal:**	4.11.3	Saunders *et al.*, (2009).
Data analysis	**Mean ratings and decision tables** **Analysis of Variance ANOVA** **Step-wise multiple regression analysis SWRA**	4.11	Soetanto and Proverbs (2001); Saunders *et al.*, (2009); Yin (2014).

4.12 Chapter summary

This chapter presented the rationale for the adopted research design and the justification for the chosen research methods. The choice of a quantitative research within the context of

project quality and customer satisfaction in construction was arrived at by observing the nature of the research questions, the philosophical underpins as well as the available time frame allocated to the research. Furthermore, an insight into the nature of the research tool, the questionnaire survey was presented taking into consideration the findings from the pilot study. The findings from the pilot study influenced the main study and the results obtained are presented in the succeeding chapter.

5. CHAPTER 5 DATA ANALYSIS AND PRESENTATION OF RESULTS

5.1 Introduction

Literature on construction project quality and customer satisfaction was reviewed in chapters 2 and 3. A conceptual framework was proposed in Chapter 3 (Figure 3.14) which aimed at establishing the interactions between the independent variable, project quality, and the dependent variable, customer satisfaction. The framework characterised these interactions on the basis of performance, reliability and aesthetics (for project quality) and contractor referral and re-patronage (for customer satisfaction). The justification for this choice was also offered in chapter 3. However, in order to establish these relationships, a suitable research methodology was proposed and justified in chapter 4.

This chapter deals with the presentation of collected and analysed data in a manner that tests the conceptual framework (Figure 3.14). Multi- linear regression analysis was carried out using the SPSS statistical tool to establish relationships and dependencies between the variables of performance, reliability, aesthetics, re-patronage and referral. The research questions included:

1. Within construction practitioners involved with government road construction projects, what level of awareness on quality and customer satisfaction exists?
2. Can the indices of project quality be used to predict customer satisfaction within government road construction projects?
3. What is the level of relationship between the attributes of project quality which include Performance, Reliability and Aesthetics and the attributes of customer satisfaction which includes contractor referral and re- patronage while handling government road construction projects in Rivers State, Nigeria?
4. Can there be a yardstick to measure the possibility of ensuring customer satisfaction from government road construction projects in Nigeria?

A total of 600 questionnaires were distributed, 518 of which were retrieved, indicating a response rate of approximately 86% of the distributed questionnaires. However, only 503 of the retrieved questionnaires were found useful, the discarded questionnaires were either incomplete or lacked coherence. For example, one of the respondents ticked “indifferent” for all the questions and did not complete the demographic aspect of the questionnaire (see appendix). In addition, some questionnaires were partially completed and had vital answers

missing ostensibly for data protection reasons by the respondents. Although research in the social sciences in general (Baruch and Holtom, 2008) and construction management in particular (Smith *et al.,* 2001; Johnson *et al.,* 2002; Al Nahyan *et al.,* 2012) report low response rates in quantitative studies, the high response rate of 86% could be attributed to the relative long period of data collection. The quantitative study for this research was carried out over a period of 5 months. This afforded the researcher ample time to allow respondents fill out the questionnaires as well as contact respondents that haven't filled out.

The data and results of each research question are presented on different tables. A summary of the results is also presented at the end of the chapter.

Justification of assumptions of step-wise multiple regression analysis.

1. Normality: Normality means that the distribution of the test is normally distributed (or bell-shaped) with 0 mean, with 1 standard deviation and a symmetric bell shaped curve. To test the assumption of normality, the Skewness test was applied. According to Tabachnick and Fidell, (2007) the acceptable range for skewness or kurtosis below +1.5 and above -1.5. Gibbons and Chakraborti (2011) however opine that in order to test the assumption of normal distribution, Skewness should be within the range ±2. Kurtosis values should be within range of ±7. Appendix 11 provides a statistical summary of the skewness of the data and indicates that the data set was normally distributed.
2. Linearity: Linearity refers the nature of relationship between the independent variable(s) and the dependent variable. If the assumption of linearity is not met, then predictions may be inaccurate. A simple scatterplot can be used to (a) determine whether a relationship is linear, (b) detect outliers and (c) graphically present a relationship. Appendix 12 presents the scatter plots of data from this research and buttresses the linearity of the data set. The presence of curved or irregular shaped scatter plots would have been an indication that the data set did not exhibit linearity and hence wouldn't be suitable for a multiple regression analysis.
3. Homoscedasticity: The SPSS provides a function to test for homoscedasticity. Homoscedasticity describes a situation in which the error term (that is, the "noise" or random disturbance in the relationship between the independent variables and the dependent variable) is the same across all values of the independent variables. Selecting variables that make up the independent variable and analysing them against

the dependent variables reveals a visual illustration that there is a similar relationship between the variables, hence indicating homoscedasticity. With the confirmation of the presence of these assumptions, the data for this research is thus presented.

5.2 Distribution of demographic variables

Table 5.1: Distribution of demographic variables of respondents

	Variable	**Frequency**	**Percentage**	**Remark**
1	***Years of working experience***	***N***	***%***	
	0-5 years	237	47.1	Dominant
	6-10 years	197	39.2	
	11-20 years	44	8.7	
	>20 years	25	5.0	
2	***Designation***	*Frequency*	*Percentage*	
	Architect	33	6.6	
	land surveyor	88	17.5	
	Quantity surveyor	41	8.2	
	Engineer	148	29.4	
	Project manager	25	5.0	
	Others	168	33.4	Dominant
3	***Category of respondent***	*Frequency*	*Percentage*	
	Government body	15	3.0	
	Contractor	383	76.1	Dominant
	Customer user	45	8.9	
	Client(private)	43	8.5	
	Funding body	15	3.0	
	Others	2	.4	
4	***Number of employees***	*Frequency*	*Percentage*	
	0-10	19	3.8	
	11-50	69	13.7	
	51-100	68	13.5	
	101-500	227	45.1	Dominant
	>500	120	23.9	
5	***Annual turn over***	*Frequency*	*Percentage*	
	<#5M	32	6.4	
	#6M-#20M	46	9.1	
	#21M-#50M	55	10.9	
	>#50M	370	73.6	Dominant

Dominant: Item with highest frequency

Table 5.1 indicated that majority of the respondents had 0-10 years of working experience which indicated a combined percentage response of about 86 %. Respondents with 0-5 years of working experience had a higher percentage, 47%. Whereas a very high percentage of Engineers were involved in the survey (29% of respondents), the category "others", which comprised of respondents involved in construction outside the categories in the questionnaire dominated the respondents (33%). In addition, a greater percentage of the respondents were contractors 76%, while majority of the construction firms that participated in the survey had between 101- 500 employees (45% of the respondents) and an annual turn- over greater than 50 Million Naira (£200,000) (74% of the respondents). It is however presumed and thus inferred that having majority of the respondents as contractors working in firms with over 100 employees would provide valid information on the quality practices that enhance satisfaction in the Nigerian construction industry.

Table 5.2: Distribution of demographic variables on road construction projects.

	Variable	**Frequency**	**Percentage**	**Remark**
6	***Number of projects***	*N*	*%*	
	<10	116	23.1	Dominant
	11-20	81	16.1	
	21-50	114	22.7	
	51-100	66	13.1	
	101-250	31	6.2	
	251-500	29	5.8	
	<500	66	13.1	
7	***Road classification***	***Frequency***	***Percentage***	
	Federal trunk A road	140	27.8	
	Federal trunk F road	54	10.7	
	State trunk B road	239	47.5	Dominant
	Local government trunk C road	70	13.9	
8	***Project type***	***Frequency***	***Percentage***	
	New road	174	34.6	
	Rehabilitation	257	51.1	Dominant
	Maintenance	72	14.3	
9	***Road length***	***Frequency***	***Percentage***	
	<1KM	52	10.3	
	2-5KM	151	30.0	
	6-10KM	130	25.8	
	>10KM	170	33.8	Dominant
10	***Project finishing***	***Frequency***	***Percentage***	

	Asphalt	426	84.7	Dominant
	Concrete	47	9.3	
	Stone base	23	4.6	
	Others	7	1.4	

Dominant: Item with highest frequency

From table 5.2 the respondents indicated that the number of projects ever handled in their respective organizations including current projects was mostly less than 10 as affirmed by 23% of the respondents. This assertion is logical as a greater majority of the respondents had between 0- 10 years of working experience although 16% of the respondents affirm that they have been involved with 11- 20 projects in the course of their career. The respondents also indicated that the state trunk B roads were mostly embarked upon by their respective companies (47% of respondents). These include internal roads owned and managed by individual state governments (Nnanna, Odoko and Alade, 2003). Furthermore, about 51% of the projects were road rehabilitation projects with 34% of the respondents affirming that the length of the roads constructed were mostly greater than 10km. In conclusion, 85% of the respondents indicated that most of the road construction projects that they participated in involved asphalting. With majority of the respondents having less than 10 years working experience, to ensure validity of responses, projects handled within the past 10 years would be referred to with majority concerned with asphalting.

5.3 Considerations for Research question 1

Within construction practitioners involved with government road construction projects, what level of awareness on quality and customer satisfaction exists?

A decision table based on the mean and standard deviations was employed to achieve this feat. The mean and standard deviation are tools of descriptive statistics used to describe both the nature of responses and the variability or spread of the distribution (Koksoy and Doganaksoy, 2003). Whereas the mean is the arithmetic average of responses, the standard deviation provides information on how the individual responses deviate from the mean. With the intention of determining the level of awareness of construction practitioners on issues relating to project quality and customer satisfaction, the mean and standard deviation give a descriptive account of the respondents' opinions on these issues. Tables 5.3 to 5.7 present the mean ratings and decisions of respondents on issues relating to project quality and customer satisfaction within Nigerian road construction projects.

5.3.1 Respondent mean rating of project performance

Table 5.3: Respondents mean rating of project performance

SN	Performance	Mean	SD	Decision
1	Projects are executed within an agreed budget	2.7873	1.47370	*
2	Construction site personnel work individually	2.5686	1.19876	*
3	Construction site personnel work in teams	**3.9642**	**1.08902**	#
4	Contractors prefer quality to cost	3.5030	1.20569	#
5	The government body which awards a contract prefers quality to cost	3.8429	1.13492	#
6	Customers (road users) prefer quality to cost	**4.1392**	**1.27515**	#
7	The client (government) determines the project design	3.5905	1.25259	#
8	The road construction projects adequately meet the commuting needs of the customers	3.5785	1.26762	#
9	Projects are designed around the needs of the customer	3.2525	1.38067	#
10	The finished project seemingly meets the design specifications	3.3777	1.12755	#
11	Complaints from intended end users about quality are handled promptly by the relevant authorities	2.7058	1.23564	*
12	Differences about quality between the government (client) and the contractors are resolved promptly.	3.1332	1.20761	#
13	Differences about quality between the government (client) and the contractors are adequately resolved.	3.4215	1.17972	#
14	Road projects are supervised by qualified government staff	3.5368	1.31121	#
15	Skill development trainings for Government staff handling road projects are provided	3.2147	1.20986	#
16	Government officials delegate supervisory responsibilities	3.5030	1.36967	#
17	Contractors offer regular skill enhancement trainings to their employees	3.2584	1.32280	#
18	Awareness on safe use of constructed road is provided by the Government	3.1332	1.44768	#
19	Road projects are executed with delays due to the clients' inability to meet the contract financial terms	3.6163	1.30349	#
20	Indigenous road construction companies are patronised by the government.	3.5308	1.38811	#
21	Construction contracts are awarded to non-indigenous road construction companies by the government	3.2982	1.52226	#
22	Benchmarking project plans of roads constructed by foreign experts	3.3108	1.37668	#
23	Contractor re- patronage for excellence is guaranteed by the client.	3.6421	1.30703	#
24	Road construction companies enjoy high level referral by their clients, the Government.	3.5865	1.31645	#
25	Contractors handling road construction projects are motivated through referral by the Government.	3.3598	1.42953	#
	Poor project performance indicators:			

26	Construction delays due to inefficient handling of materials	2.7217	1.48367	*
27	Contractors' inability to meet their wage obligations to employees	3.3439	1.11803	#
28	Client's inability to make scheduled payments to contractors.	3.6143	1.22651	#
29	Project abandonment due to design failure	2.6978	1.31045	*
30	Accelerated construction by the contractor due to unsafe working environment.	3.1014	1.14125	#
31	Project abandonment due to low cash flow	**3.9761**	**1.22370**	#
32	Incessant project abandonment and restarting	3.5964	1.00900	#

**** Disagreed, #=Agreed***

The result on Table 5.3 above indicated that the respondents in a bid to establish their awareness on quality and customer satisfaction strongly agreed that customers (road users) preferred quality to cost (M=4.1392, SD=.1.27515), this was followed by the fact that construction site personnel work in teams (M=3.9642, SD=1.08902) if they desired to improve construction quality and achieve customer satisfaction. On the poor project indicators, the respondents indicated that project abandonment due to low cash flow (M=3.9761, SD=1.22370) was a major contributor to poor construction quality and customer dissatisfaction. Table 5.3 further showed that five items were rated below the criterion mean cut off point of 3.0 (disagreed). The respondents disagreed on the fact that projects were executed within an agreed budget (M=2.7873, SD=1.47370), construction site personnel performed better when they worked individually (M=2.5686, 1.19876), complaints from intended end users about quality were handled promptly by the relevant authorities (M=2.7058, SD=1.23564), inefficient handling of materials led to construction delays (M=2.7217, SD=1.48367) as well as design failure being responsible for project abandonment. It can however be inferred that other issues were responsible for construction delays and project abandonment (Onohaebi and Lawal, 2010) rather than inefficient materials handling and design failure (Olateju, Abdul- azeez and Alamutu, 2011) and these would be investigated consequently.

5.3.2 Respondents mean rating of project reliability

Table 5.4: Respondents mean rating of project reliability

SN	Reliability	Mean	SD	Decision
33	Contractors conform to designed specification	3.8072	1.14514	#
34	Project designs contain sufficient details	3.8449	1.11304	#

35	Project construction entails the adoption of international best practices (benchmarking) by the contractors.	2.9423	1.27443	*
36	Road projects should be procured on a 'build and maintain' basis.	3.9304	1.28318	#
	Professional expertise should be utilized:	**Mean**	**SD**	
37	Project design	4.0358	1.32953	#
38	Project management	3.9642	1.26346	#
39	Project auditing	3.8986	1.38131	#
40	Financial management	**4.0736**	**1.23065**	#
41	Quality control	3.9920	1.22553	#
42	Construction equipment operation	4.0676	1.18397	#
	Opinion on issues pertaining to project reliability:	**Mean**	**SD**	
43	Contractors exhibit improvements from past projects	4.0358	1.32953	#
44	Clients (Government body) monitor contractors closely to deliver project.	3.9642	1.26346	#
45	Defects are addressed before project handover	3.8986	1.38131	#
46	Completed road undergoes frequent maintenance by contractors that constructed the road where applicable.	4.0736	1.23065	#
47	An independent contractor is needed for project maintenance	3.9920	1.22553	#
48	Spontaneous inspection should be carried out by top Government officials	4.0676	1.18397	#
49	Community leaders should be involved with road inspections	3.8827	1.12033	#
50	The Government body should enforce strict penalties for health and safety regulations violation.	**4.1312**	**1.17013**	#
51	Health and safety considerations by contractors are top priority from planning to execution	4.0278	1.07081	#
52	The knowledge of reliability (non- failure within given time) from past projects influences referral	3.4274	1.49308	#

53	The judgement of the project users through post project evaluations influences re- patronage by the client (government).	3.1889	1.70367	#

**** Disagreed, #=Agreed***

In order to establish the awareness of the respondents on quality and customer satisfaction, the result on Table 5.4 above indicated that the respondents strongly opined that the Government body should enforce strict penalties for the violation of health and safety regulations (M=4.1312, SD=1.17013). The respondents opined that to improve the quality of constructed roads and enhance customer satisfaction, completed road projects should undergo frequent maintenance by contractors that constructed the road where applicable alongside the implementation of and financial management practice to aid the project reliability ((M=4.0736, SD=1.23065) respectively. In addition, the respondents affirmed that spontaneous inspection should be carried out by top Government officials (M=4.0676, SD=1.18397), and this should continue throughout the life cycle of the construction project. The respondents however indicated that post project evaluations influenced re- patronage by the client (government), although this was the least agreed variable (M=3.1889, SD=1.70367). On the other hand, only one item was rated below the criterion mean cut off of 3.0; that is the fact that road construction projects entailed the adoption of international best practices (benchmarking) by the contractors (M=2.9423, SD=1.27443). The respondents disagreed on this single fact, thereby asserting that the other items in table 5.3 were sure indicators of the awareness of quality and customer satisfaction.

5.3.3 Respondents mean rating of project Aesthetics

Table 5.5: Respondents mean rating of project Aesthetics

SN	Aesthetics	Mean	SD	Decision
54	The Government body which awards the contract insist on using standard approved materials only	**4.2028**	**1.24756**	#
55	Contractors adhere to the ISO standards they subscribe to in carrying out construction jobs	3.6759	1.30291	#
56	A Condition of the contract award entails strict adherence to quality standard implementation	**4.2187**	**1.02162**	#
57	Specifications conform to world class standards	3.4553	1.53495	#
	Modern technology is utilised in road	3.8926	1.20936	#

	construction:			
58	Information Technology	**4.1412**	**.96655**	#
59	Automation of construction equipment e.g. programmable concrete mixers.	4.0000	1.09144	#
60	Knowledge management particularly the sharing of information from top management to bottom staff	3.9503	1.09304	#
61	Traffic simulations	4.1650	1.02100	#
62	Mechanisation instead of manual labour	4.0855	1.09991	#
63	In the Surveillance of project against vandals	**4.2028**	**1.24756**	#
	Opinion on project quality issues pertaining to aesthetics:			
64	Government road projects contain excitement factors otherwise called "Artistic Inventions"	3.1948	1.51020	#
65	Project designs are uniquely adapted to the project environment	3.7555	1.19504	#
66	Physical appearance of road is top priority to customers	3.3936	1.45316	#
67	Physical appearance is a measure of quality of road	2.7416	1.33181	*
68	Project beauty does not undermine its efficiency	**4.0477**	**1.16801**	#
69	The contractor's choice of material for project finishing poses no health hazards.	3.2147	1.42321	#
70	The approved design choice of materials for project finishing complies with health and safety standards.	3.4632	1.33678	#
71	Issues on the physical nature of the finished project are included in post project customer satisfaction surveys	3.4095	1.43076	#
72	Nature of road aesthetics can determine contractor re-patronage	3.8290	1.16326	#
73	Aesthetic quality of finished road influences contractor referral.	3.7913	1.11766	#

**** Disagreed, #=Agreed***

The result on Table 5.5 above shows that the respondents strongly agreed that strict adherence to quality standard implementation needed to be a condition for contract award (M=4.2187, SD=1.02162). On the awareness of quality and customer satisfaction, the

respondents agreed that the Government body which awards the contract should insist on using standard approved materials only, while utilizing modern technology in providing surveillance on the construction project against vandals (M=4.2028, SD=1.24756) respectively. The respondents showed slight agreement on the presence of excitement factors otherwise called *"Artistic Inventions"* (M=3.1948, SD=1.51020) in government road construction projects. On the contrary, the respondents disagreed that within Nigerian road construction projects, physical appearance was a measure of quality of road (M=2.7416, SD=1.33181). In conclusion, since all the items except one (item 67) were rated above 3.0, it could be averred that the respondents agreed that the above items were measures of project aesthetics which consequently were used to quantify project quality and customer satisfaction.

5.3.4 Respondents mean rating of contractor Re- patronage

Table 5.6: Respondents mean rating of contractor Re- patronage

SN	Re- patronage	Mean	SD	Decision
74	Road projects in Rivers State in comparison with other world class roads	3.3320	1.44042	#
75	Adherence to health and safety requirements by contractors involved with road construction.	3.3698	1.04788	#
76	Presence of Excitement (innovative) factors in the constructed roads.	2.9185	1.19399	*
77	Ease of pedestrian movement	3.7992	1.17470	#
78	Ease of vehicular movement during construction.	3.6799	1.19883	#
79	Project planning.	3.8887	1.08573	#
80	Provision of alternative routes during construction.	**3.9960**	**1.12203**	#
81	Contractors' use of labour from host community	**4.0477**	**1.20164**	#
82	Facilitated construction process through use of foreign expertise by the contractors	3.5129	1.13761	#
83	Efficient construction waste management by contractors	3.1988	1.30592	#
	Satisfaction with the finished road projects:			
84	Agreed cost	2.8986	1.18576	*
85	Conformance to scheduled delivery time	2.6481	1.29565	*

86	Customer assessment of satisfaction through post project evaluations	3.2903	1.06709	#
87	Providing economic development to the host community	**3.9324**	**1.06530**	#
88	Exceeding user expectation	3.3400	1.06826	#
89	Contractor re- patronage	3.7575	1.07896	#
90	Indigenous contractors project delivery	3.2406	1.12549	#
91	Contractual agreement support for use of indigenous labour	3.7555	1.18668	#

**** Not satisfied, #=Satisfied***

The result on Table 5.6 above shows that the respondents were highly satisfied with contractors' use of labour from host community (M=4.0477, SD=1.20164), an indication of its relevance to influence road construction quality and customer satisfaction. This was followed by their satisfaction with the finished road projects in terms of providing economic development to the host community (M=3.9324, SD=1.06530) among others. However, the respondents were not satisfied with finished road projects in terms of agreed cost (M=2.8986, SD=1.18576) and conformance to scheduled delivery time (M=2.6481, SD=1.29565), as these transcended to quality issues and customer dissatisfaction. The result on Table 5.5 above further indicates that the respondents were satisfied with the variables in the table and they items therein were sufficient to characterise customer re-patronage.

In summary, a frequency distribution table is employed to show the number of occurrences of the respondent's opinions on their level of awareness on quality and customer satisfaction within Nigerian road construction projects and these are presented in Tables 5.6a and 5.6b.

Table 5.6a: Frequency distribution of responses involving agreement.

Rank	Degree of agreement	Number of occurrence
1	Strongly agree	247
2	Agree	197
3	Indifferent	13
4	Disagree	29
5	Strongly disagree	16

Table 5.6b: Frequency distribution of responses involving satisfaction.

Rank	Degree of Satisfaction	Number of occurrence

1	Highly satisfied	69
2	Satisfied	48
3	Indifferent	9
4	Un-satisfied	17
5	Highly un-satisfied	4

The frequency distribution table further affirms that majority of the respondents either agreed or strongly agreed, and were either satisfied or highly satisfied with the constructs of the questionnaire, an indication of their awareness of issues relating to quality and customer satisfaction in construction. In addition, by inspection, the data obtained is normally distributed as the means (although not evenly distributed) are all around the mid-point 3.0. consequently, the data conforms to the assumptions required for multiple regression analysis, which hold that there should be linearity between the variables, and the variables are not highly skewed (positively or negatively). A concise explanation of the assumptions for modelling from a multiple regression analysis is provided in section 6.2.

5.3.5 Respondents mean rating of contractor referral

Table 5.7: Respondents mean rating of contractor Referral

SN	Referral	Mean	SD	Decision
92	On time completion of road construction	2.8370	1.37901	*
93	Physical judgement of the strength of materials used	3.4771	1.15311	#
94	Alternative commuting measures in place while carrying out construction	3.7197	1.00346	#
95	Use of automated (mechanised) equipment	**4.0080**	**1.05993**	#
96	Benefits of road project over its cost	3.6481	1.18986	#
	Satisfied with government constructed roads:			#
97	Durability of the road	3.3877	1.35479	#
98	Project reliability in terms of time before road maintenance is required	3.7594	1.09680	#
99	Provision of drains	**4.3678**	**1.04763**	#
100	Provision of pedestrian pathways	**4.3360**	**1.06765**	#
101	Relationship between contractors and the host community	**4.1511**	**1.08275**	#
102	Maintenance culture of constructed roads	2.7157	1.29075	*

103	Contractor referral based on evidence of successful completed projects.	3.8966	1.09747	#

**** Not satisfied, #=Satisfied***

The result on Table 5.7 above indicated that the respondents were highly satisfied with government constructed roads in terms of provision of drains (M=4.3678, SD=1.04763), provision of pedestrian pathways (M=4.3360, SD=1.06765) and relationship between contractors and the host community (M=4.1511, SD=1.08275 among others. Satisfaction with the provision of drains, pedestrian pathways as well as the cordial relationship between contractors and host communities are however viewed as an indication of the awareness of the respondents on the influence of these on road construction quality and customer satisfaction. The respondents were also highly satisfied with the use of automated (mechanised) equipment (M=4.0080, SD=1.05993). However, the respondents were not satisfied with on time completion of road construction (M=2.8370, SD=1.37901) and maintenance culture of constructed roads (M=2.7157, SD=1.29075). In conclusion, Table 5.7 above indicates that the respondents were satisfied with the variables that described contractor referral. Consequently, it could be inferred that the participants to the research who collectively are construction practitioners or could be potential stakeholders to road construction projects have a vast knowledge on the issues concerning project quality and customer satisfaction especially in the Nigerian context. The next step would be to find out the relationships between the attributes of project quality and customer satisfaction as well as the percentage contributions of these attributes based on the relationships between them.

5.4 Considerations for Research question 2

Can the indices of project quality be used to predict customer satisfaction within government road construction projects?

In order to effectively provide answers to research question 2, multi- linear stepwise regression was carried out on the data set to obtain individual and collective relationships between the variables of project quality and customer satisfaction. The computations from the analysis generated the following results.

a. **R, R^2 and Adjusted R^2 Values:** The "R" value signifies the correlation between the independent and dependent variables. Thus it gives an indication on the relationship between the variables. R^2 on the other hand is the percentage of variance explained by the model (regression model in this case). The R^2 value signifies the fraction by which the variance of

the errors is less than the variance of the dependent variable. Considering multiple regression models, R^2 is determined by the pairwise correlations between the independent variables, as well as between the dependent and independent variables. However, the Adjusted R^2 value is usually preferred to the R^2 value and it depicts the predicting power of the dependent variable on the independent variable. Statistically, the adjusted R-squared is equal to 1 minus (n - 1)/(n – k - 1) times 1-minus-R-squared, where n is the sample size and k is the number of independent variables.

b. **Standard error:** This is the estimated standard deviation of the unexplainable variations in the dependent variable and an indication of the deviation from the mean without the degrees of freedom adjustment.

c. **Un-standardised and Standardised coefficients:** Un-standardised coefficients, usually denoted by "**B**" are raw units of measurements which show the relationship between increments of the same unit. However, due to the fact that the responses in the questionnaire survey are of different units, a single "z"- score unit is employed to bring the different units to unison thus leading to the use of standardised coefficients. Standardised coefficients, usually denoted by the Greek letter "**β**" give an insight into how increments (or reductions) in the independent variable affect relative positions within a data set or group that have been converted to a singular "z" score unit.

d. **t-value:** This is the estimated coefficient divided by its own standard error. The t- value gives insights into the conformance of the independent variable to the generated regression model, testing if the true value of the coefficient is non- zero.

e. **ANOVA**: Analysis of Variance (ANOVA) is a statistical method that tests the degree to which two or more groups differ from each other. This method establishes the difference by testing the differences between two or more means in a particular experiment or survey. ANOVA is usually employed when the need arose to test general differences rather than specific differences.

e. **Sum of squares:** This represents a measure of variation from the mean through a summation of the squares of the differences from the mean. The sum of squares is important in regression as it determines the proportion of total variation that is explained by the regression model R^2. The larger this value, the better the relationship between the variables regressed.

f. **Degree of freedom:** The degree of freedom, denoted by d*f* is an indication of the number of predictors used.

g. **F.statistic:** This is a measure that inquires whether the regression is statistically significant or not. In the SPSS output, the F- statistic is usually denoted by "F".

Sequel to the definition of the output terms from the regression analysis, the relationships between the dependent variable (customer satisfaction) and independent variable (project quality) within Nigerian road construction projects are presented in the following tables.

5.4.1 Relationship between Project quality (Performance, Reliability & Aesthetics) and Customer satisfaction (Re-patronage)

Table 5.8: Model summary of stepwise regression analysis on the relative contribution of project quality variables to customer satisfaction (Re-patronage)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657[a]	.432	.431	9.17885
2	.730[b]	.533	.532	8.32937
3	.742[c]	.550	.548	8.18379
a. Predictors: (Constant), Performance				
b. Predictors: (Constant), Performance, Reliability				
c. Predictors: (Constant), Performance, Reliability, Aesthetics				

Table 5.9: Regression coefficients of project quality to customer satisfaction (Re-patronage)

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	20.921	2.525		8.285	.000
	Performance	.720	.037	.657	**19.529**	**.000**
2	(Constant)	5.816	2.712		2.144	.032
	Performance	.557	.037	.508	15.061	.000
	Reliability	.343	.033	.351	10.412	.000
3	(Constant)	4.555	2.680		1.699	.090
	Performance	.460	.043	.419	10.778	.000
	Reliability	.257	.038	.264	6.795	.000
	Aesthetics	.192	.044	.198	4.353	.000

a. Dependent Variable: Re-patronage

Regression equations:

Rp=20.921+.720Pf (1)

Rp=5.816+.557Pf+.343Ry (2)

Rp=4.555+.460Pf+.257Ry+.192As (3)

Table 5.10: Regression ANOVA[d] of project quality to customer satisfaction (Re-patronage)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32132.392	1	32132.392	381.387	.000[a]
	Residual	42209.934	501	84.251		
	Total	74342.326	502			
2	Regression	39653.122	2	19826.561	285.774	.000[b]
	Residual	34689.204	500	69.378		
	Total	74342.326	502			
3	Regression	40922.064	3	13640.688	203.670	.000[c]
	Residual	33420.262	499	66.974		
	Total	74342.326	502			
a. Predictors: (Constant), Performance						
b. Predictors: (Constant), Performance, Reliability						
c. Predictors: (Constant), Performance, Reliability, Aesthetics						
d. Dependent Variable: Re-patronage						

Table 5.11: Excluded Variables of project quality to customer satisfaction (Re-patronage)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Reliability	.351[a]	10.412	.000	.422	.820
	Aesthetics	.359[a]	8.833	.000	.367	.596
2	Aesthetics	.198[b]	4.353	.000	.191	.435
a. Predictors in the Model: (Constant), Performance						
b. Predictors in the Model: (Constant), Performance, Reliability						
c. Dependent Variable: Re-patronage						

Table 5.8 showed the relative contributions of project quality variables (Performance, Reliability and Aesthetics) to the observed variance in the Customer satisfaction (Re-patronage). Project Performance, Reliability and Aesthetics were used in a stepwise multiple regression analysis to predict Customer satisfaction (Re-patronage). Table 5.8 confirmed that project performance was the best predictor of contractor Re-patronage among construction companies in Rivers State when compared with Performance and Reliability. Looking at the results in Table 5.9 (coefficients), the value pulled by project performance was higher than the one pulled by project reliability and aesthetics. It showed project performance alone accounted for approximately 43.1% of the variance in Re-patronage (R^2 =.432, Adjusted R^2 =.431). The project performance and Reliability only entered the equation in the second interaction while aesthetics did not enter at 0.05 levels. (Soetanto and Proverbs, 2001; Cohen *et.al.,* 2013). Then performance and reliability accounted for about 53.2% of the observed variance in Customer satisfaction (Re-patronage). That is, only project reliability accounted for about 10.1% to the variance in Re-patronage (R^2 =.533, Adjusted R^2 =.532). The Table 5.8 also shows that at the third interaction, all three independent variables entered the equation in the prediction of Customer satisfaction (Re-patronage). It shows that Performance, Reliability and Aesthetics jointly accounted for approximately 54.8% of the variance in Re-patronage (R^2 =.550, Adjusted R^2 =.548). This revealed that the project performance was the strongest predictor of Contractor Re-patronage. The prediction model contained three predictors and was reached in three steps with two variables removed in the first step, one removed in the second step and none removed in the last step (Cohen *et al.,* 2013).

Table 5.9 (Coefficients) gives the predictor variables in the regression equation, the Beta values, and significant T corresponding to the variables regressed against the dependent variable. A glance at Table 5.9 (Coefficients) reveals that the Beta values for performance, reliability and aesthetics were found to be highly significant (β =.720; t = 19.529, p=0.00), (β =.343; t = 10.412, p=0.00) and (β =.192; t = 4.353, p=0.00) respectively. The equations 1, 2 and 3 respectively indicate that any increase in the value of any of the independent variables will yield a resultant increase in the value of re-patronage.

The result on Table 5.10 (ANOVA) further indicated that project Performance (F1, 501=381.387, p=.000), Performance and reliability (F2, 500=285.774, p=.000) and

performance, reliability and aesthetics (F3, 499=203.670, p=.000) were significant predictors of contractor Re-patronage respectively.

Table 5.12: Mean, standards deviations and inter-correlations among predictors and Re-patronage for total sample (N = 503)

	Variables				
		1	**2**	**3**	**4**
1.	Performance	1			
2.	Reliability	.425**	1		
3.	Aesthetics	.636**	.633**	1	
4	Re-patronage	**.657****	**.567****	**.632****	1
	Mean	67.5666	76.2763	74.6282	69.5825
	Standard Deviation	11.10880	12.47089	12.53151	12.16932

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation matrix means and standard deviations of the measured variables are presented in Table 5.12. The results on Table 5.12 showed that project performance, Reliability and Aesthetics significantly correlated with contractor Re-patronage, (r =.657, p=0.00), (r=.567, p=0.00) and (r=.632, p=0.00) respectively). This indicated that project performance; Reliability and Aesthetics were predictors of contractor Re-patronage. Table 5.12 further revealed that the percentage mean score of the respondents in all the variables measured were above 65.0%.

Table 5.13: Summary of Regression Analysis between the predictor variables and Contractor Re-patronage

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.742[a]	.550	.548	8.18379

a. Predictors: (Constant), Aesthetics, Reliability, Performance

Table 5.14: Regression Coefficients[a] of the predictor variables and Contractor Re-patronage

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.555	2.680		1.699	.090
	Performance	.460	.043	.419	10.778	.000
	Reliability	.257	.038	.264	6.795	.000
	Aesthetics	.192	.044	.198	4.353	.000
a. Dependent Variable: Re-patronage						

Rp =4.555+.460Pf+.257Ry+.192As (4)

Table 5.15: Regression ANOVA[b] of the predictor variables and Contractor Re-patronage

Model		Sum of Squares	df	Mean Square	F	Sig.
R=.742 R^2=.550 Adj. R^2=.548 SE=8.18379	Regression	40922.064	3	13640.688	203.670	.000[a]
	Residual	33420.262	499	66.974		
	Total	74342.326	502			
a. Predictors: (Constant), Aesthetics, Reliability, Performance						
b. Dependent Variable: Re-patronage						

Tables 5.13- 5.15 above show the values of the parameters of the regression analysis between the predictor variables and Re-patronage. The results of the analysis showed that predictor variables predicted Re-patronage of contractors of construction companies. The predictor variables taken against the criterion variable yielded a coefficient of multiple correlations (R) of .742 and multiple correlation square (R^2) of .550 and adjusted R^2 of .548. The adjusted R^2

value translated into 54.8% of the observed variance in the Re-patronage scores. The regression equation 4 on Table 5.14 (Regression coefficients) shows that an increase in any of the independent variables will yield a concomitant increase in the dependent variable. The analysis also gave a standard error (SE) of 8.18379 and F-value of 203.670 significant at an alpha level of .01.

5.4.2 Relationship between Project quality (Performance, Reliability & Aesthetics) and customer satisfaction (Referral)

Table 5.16: Model summary of stepwise regression analysis on the relative contribution of project quality variables to customer satisfaction (Referral)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.756[a]	.572	.571	8.70086
2	.787[b]	.619	.618	8.21573
a. Predictors: (Constant), Aesthetics				
b. Predictors: (Constant), Aesthetics, Performance				

Table 5.17: Regression Coefficients[a] of project quality to customer satisfaction (Referral)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14.012	2.345		5.975	.000
	Aesthetics	.802	.031	.756	25.884	.000
2	(Constant)	5.431	2.468		2.200	.028
	Aesthetics	.612	.038	.577	16.151	.000
	Performance	.337	.043	.281	7.869	.000
a. Dependent Variable: Referral						

Rf =14.012+.802As *(5)*

Rf=5.431+.612As+.337Pf *(6)*

Table 5.18: Regression ANOVA[c] of project quality to customer satisfaction (Referral)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	50721.660	1	50721.660	669.991	.000[a]
	Residual	37928.197	501	75.705		
	Total	88649.857	502			
2	Regression	54900.741	2	27450.370	406.683	.000[b]

	Residual	33749.116	500	67.498		
	Total	88649.857	502			
a. Predictors: (Constant), Aesthetics						
b. Predictors: (Constant), Aesthetics, Performance						
c. Dependent Variable: Referral						

Table 5.19: Excluded Variables[c] of project quality to customer satisfaction (Referral)

Model		**Beta In**	**T**	**Sig.**	**Partial Correlation**	**Collinearity Statistics**
						Tolerance
1	Performance	.281[a]	7.869	.000	.332	.596
	Reliability	-.029[a]	-.781	.435	-.035	.599
2	Reliability	-.040[b]	-1.120	.263	-.050	.599
a. Predictors in the Model: (Constant), Aesthetics						
b. Predictors in the Model: (Constant), Aesthetics, Performance						
c. Dependent Variable: Referral						

Tables 5.16-5.19 above showed the relative contributions of project quality variables (Performance, Reliability and Aesthetics) to the observed variance in the Customer satisfaction (Referral). Project Performance, Reliability and Aesthetics were used in a stepwise multiple regression analysis to predict Customer satisfaction (Referral). Table 5.16 established that Aesthetics was the best predictor of contractor Referral among construction companies in Rivers State when compared with project Performance and Reliability. It showed project Aesthetics alone accounted for approximately 57.1% of the variance of Referral (R^2 =.572, Adjusted R^2 =.571). The project Performance and Reliability did not enter the equation at 0.05 levels in the first interaction. This revealed that the project performance and Reliability were weaker predictors of Contractor Referral when compared with Aesthetics. The prediction model-1 contained only one of the three predictors with two excluded and the result on Table 5.18 (ANOVA-1) further indicated that project Aesthetics was a significant predictor of contractor Referral ($F_{(1, 501)}$ =669.991, $p=0.00$).

The prediction model-2 (Table 5.16) contained only two of the three predictors (Aesthetics and Performance) and was reached in two steps with one variable (Reliability) removed. The result on Table 5.16, model-2 showed that Aesthetics and Performance entered the equation

in the second interaction. Consequently, Performance and Aesthetics accounted for about 61.8% of the observed variance in Customer satisfaction (Referral). That is, only project Performance accounted for about 4.7% to the variance in Referral (R^2 =.619, Adjusted R^2 =.618).

Table 5.17 (Coefficients) gives the predictor variables in the regression equation, the Beta values, and significant T corresponding to the variables regressed against the dependent variable (Referral). A glance at Table 5.17 (Coefficients) reveals that the Beta values for Aesthetics (β =.802; t = 25.884, p=0.00) for first interaction was significant. Also Aesthetics (β =.612; t = 16.151, p=0.00) and performance (β =.337; t = 7.869, p=0.00) were also respectively significant. The equations (5) and (6) on Table 5.17 respectively indicate that any increase in the value of any of the independent variables will yield a resultant increase in the value of Referral. The result on Table 5.18 (ANOVA-2) further indicated that project Aesthetics and Performance were joint significant predictors of contractor Referral ($F_{(1, 500)}$ =406.683, *p=0.00*).

Table 5.20: Mean, standards deviations and inter-correlations among predictors and Referral for total sample (N = 503)

	Variables				
		1	**2**	**3**	**5**
1.	Performance	1			
2.	Reliability	.525**	1		
3.	Aesthetics	.636**	.633**	1	
5	Referral	**.659****	**.561****	**.756****	1
	Mean	67.5666	76.2763	75.6282	73.8728
	Standard Deviation	11.10880	12.57089	12.53151	13.28885

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation matrix means and standard deviations of the measured variables are presented in Table 5.20. It shows that project performance, Reliability and Aesthetics significantly correlated with contractor Referral (r =.649, p=0.00), (r=.461, p=0.00) and (r=.876, p=.756) respectively). This indicated that project performance; Reliability and Aesthetics were predictors of contractor Referral. Table 5.20 further revealed that the percentage mean score of the respondents in all the variables measured were above 65.0%.

Table 5.21: Summary of Regression Analysis between the predictor variables and Contractor Referral

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.788[a]	.620	.618	8.21364
a. Predictors: (Constant), Aesthetics, Reliability, Performance				

Table 5.22: Regression Coefficients[a] between the predictor variables and Contractor Referral.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.631	2.690		2.465	.014
	Performance	.338	.043	.283	7.907	.000
	Reliability	-.043	.038	-.040	-1.120	.263
	Aesthetics	.638	.044	.602	14.387	.000
a. Dependent Variable: Referral						

Rf=6.631+.338Pf -.043Ry+.638As *(7)*

Table 5.23: Model Summary on between the predictor variables and Contractor Referral

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.788[a]	.620	.618	8.21364
a. Predictors: (Constant), Aesthetics, Reliability, Performance				

Table 5.24: ANOVA[b] between the predictor variables and Contractor Referral

Model		Sum of Squares	df	Mean Square	F	Sig.
R=.788[a]	Regression	54985.390	3	18328.463	271.678	.000[a]
R^2=.620						
	Residual	33664.467	499	67.464		
Adj. R^2=.618						
	Total	88649.857	502			
SE=8.21364						
a. Predictors: (Constant), Aesthetics, Reliability, Performance						
b. Dependent Variable: Referral						

Table 5.21-5.24 above shows the values of the parameters of the regression analysis between the predictor variables and Referral. The results of the analysis showed that predictor variables predicted Referral of contractors of construction companies. The regression equation (7) (Table 5.22) shows that any increase in any of the Aesthetics and Performance will yield a concomitant increase in the value of the Referral. An increase in Reliability may not yield a resultant increase in Referral. The predictor variables taken against the criterion variable (Referral) yielded a coefficient of multiple correlations (R) of =.788 and multiple correlation square (R^2) of .620 and adjusted R^2 of .618. The adjusted R^2 value translated into 61.8% of the observed variance in the Referral scores. The analysis also gave a standard error (SE) of 8.21364and F-value of 271.678 significant at an alpha level of .01.

5.5 Considerations for research question 3

"What is the level of relationship between the attributes of project quality which include Performance, Reliability and Aesthetics and the attributes of customer satisfaction which includes contractor referral and re- patronage while handling government road construction projects in Rivers State, Nigeria?"

5.6 Individual relationships between the variables of project quality and customer satisfaction.

Having established the fact that the attributes of project quality which include Performance, Reliability and Aesthetics are valuable predictors of customer satisfaction (Referral and re-Patronage), it is imminent to provide individual contributions of the variables of project

quality to customer satisfaction. Again the data was subjected to regression and analysis of variance ANOVA to achieve this feat.

5.6.1 Relationship between Project Performance and Re-patronage

Table 5.25: Summary of regression analysis on the relationship between Performance and Re- Patronage.

Variable	Mean	Std. Deviation	N
Re-patronage	69.5825	12.16932	503
Performance	67.5666	11.10880	503

Table 5.26: Model Summary on the relationship between Performance and Re-Patronage.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657[a]	.432	.431	9.17885
a. Predictors: (Constant), Performance				

Table 5.27: Coefficients[a] on the relationship between Performance and Re- Patronage.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	20.921	2.525		8.285	.000
	Performance	.720	.037	.657	19.529	.000
a. Dependent Variable: Re-patronage						

Rp=20.921+.720Pf *(8)*

Table 5.28: Regression ANOVA[b] on the relationship between Performance and Re-Patronage.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	32132.392	1	32132.392	381.387	.000[a]
	Residual	42209.934	501	84.251		
	Total	74342.326	502			
a. Predictors: (Constant), Performance						
b. Dependent Variable: Re-patronage						

The result on Table 5.26 (Model summary) above shows that rp-value of .657 shows a strong relationship between project performance and contractor Re-patronage. The regression equation (8) shows that any increase in the value of project performance will yield an associated increase in the value of the contractor Re-patronage. The adjusted r^2-value of .431 indicates roughly the contribution of 43.1% by project performance to Re-patronage. Furthermore, Table 5.28 (ANOVA) indicates a significant relationship between project performance and contractor Re-patronage in construction companies in Rivers State (F1, 501=381.387, p=.000).

5.6.2 Relationship between Project Performance and Referral

Table 5.29: Summary of regression analysis on the relationship between performance and Referral

Variable	Mean	Std. Deviation	N
Referral	73.8728	13.28884	503
Performance	67.5666	11.10880	503

Table 5.30: Model Summary on the relationship between performance and Referral

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.649[a]	.421	.420	10.12468
a. Predictors: (Constant), Performance				

Table 5.31: Coefficients[a] on the relationship between performance and Referral

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.449	2.785		7.701	.000
	Performance	.776	.041	.649	19.074	.000
a. Dependent Variable: Referral						

Rf=21.449+.776Pf *(9)*

Table 5.32: Regression ANOVA[b] on the relationship between performance and Referral

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	37292.775	1	37292.775	363.799	.000[a]
	Residual	51357.082	501	102.509		
	Total	88649.857	502			
a. Predictors: (Constant), Performance						
b. Dependent Variable: Referral						

Table 5.30 (Model summary) above shows that rp-value of .649 shows a strong relationship between project performance and contractor Referral. The regression equation (9) shows that any increase in the value of project performance will yield a resultant increase in the value of the contractor Referral. The adjusted r^2-value of .420 indicates roughly the contribution of 42.0% by project performance to Referral. Furthermore, Table 5.32 (ANOVA) indicates a significant relationship between project performance and contractor Referral in construction companies in Rivers State ($F_{1, 501}=363.799$, $p=.000$).

5.6.3 Relationship between Project Reliability and Re-patronage

Table 5.33: Summary of regression analysis on the relationship between Project Reliability and Re-patronage

Variable	Mean	Std. Deviation	N
Re-patronage	69.5825	12.16932	503
Reliability	76.2763	12.47089	503

Table 5.34: Model Summary on the relationship between Project Reliability and Re-patronage

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.567[a]	.322	.320	10.03261
a. Predictors: (Constant), Reliability				

Table 5.35: Coefficients[a] on the relationship between Project Reliability and Re-patronage

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27.367	2.775		9.862	.000
	Reliability	.553	.036	.567	15.414	.000
a. Dependent Variable: Re-patronage						

Table 5.36: Regression ANOVA[a] on the relationship between Project Reliability and Re-patronage

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	23915.011	1	23915.011	237.598	.000[a]
	Residual	50427.315	501	100.653		
	Total	74342.326	502			
a. Predictors: (Constant), Reliability						
b. Dependent Variable: Re-patronage						

Table 5.34 (Model summary) above shows that rp-value of .567 shows a strong relationship between project Reliability and Re-patronage. The regression equation (10) shows that any increase in the value of project Reliability will yield a concomitant increase in the value of the Re-patronage. The adjusted r^2-value of .320 indicates roughly the contribution of 32.0%

by project reliability to Re-patronage. Furthermore, Table 5.36 (ANOVA) indicates that project Reliability significantly predicts Re-patronage within the road construction sector in Rivers State (F1, 501=237.598, p=.000).

5.6.4 Relationship between Project Reliability and Referral

Table 5.37: Summary of regression analysis on the relationship between Project Reliability and Referral

Variable	Mean	Std. Deviation	N
Referral	73.8728	13.28884	503
Reliability	76.2763	12.47089	503

Table 5.38: Model Summary on the relationship between Project Reliability and Referral

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.461[a]	.213	.211	11.80341
a. Predictors: (Constant), Reliability				

Table 5.39: Coefficients[a] on the relationship between project Reliability and Referral

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	36.393	3.265		11.147	.000
	Reliability	.491	.042	.461	11.632	.000
a. Dependent Variable: Referral						

Rf=36.393+.491Ry (11)

Table 5.40: Regression ANOVA[b] on the relationship between Project Reliability and Referral

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18850.351	1	18850.351	135.302	.000[a]
	Residual	69799.506	501	139.320		
	Total	88649.857	502			
a. Predictors: (Constant), Reliability						
b. Dependent Variable: Referral						

Table 5.38 (Model summary) above shows that rp-value of .461 shows a strong relationship between project Reliability and Referral. The regression equation (11) (Table 5.39) shows that any increase in the value of project Reliability will yield a concomitant increase in the value of the Referral. The adjusted r^2-value of .211 indicates roughly the contribution of 21.1% by project reliability Referral. Furthermore, Table 5.40 (ANOVA) indicates that project Reliability significantly predict Referral of contracting firms within the construction sector in Rivers State (F1, 501=135.302, p=.000)

5.6.5 Relationship between Project Aesthetics and Re-patronage

Table 5.41: Summary of regression analysis on the relationship between Project Aesthetics and Re-patronage

Variable	Mean	Std. Deviation	N
Re-patronage	69.5825	12.16932	503
Aesthetics	74.6282	12.53151	503

Table 5.42: Model Summary on the relationship between Project Aesthetics and Re-patronage

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.632[a]	.399	.398	9.44281
a. Predictors: (Constant), Aesthetics				

Table 5.43: Coefficients[a] on the relationship between Project Aesthetics and Re-patronage

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	23.799	2.545		9.352	.000
	Aesthetics	.613	.034	.632	18.241	.000
a. Dependent Variable: Re-patronage						

Rp=23.799+.613As (12)

Table 5.44: Regression ANOVA[b] on the relationship between Project Aesthetics and Re-patronage

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29669.791	1	29669.791	332.745	.000[a]
	Residual	44672.535	501	89.167		
	Total	74342.326	502			
a. Predictors: (Constant), Aesthetics						
b. Dependent Variable: Re-patronage						

Table 5.42 (Model summary) above shows that rp-value of .632 shows a strong relationship between project Aesthetics and Re-patronage. The regression equation (12) (Table 5.43) shows that any increase in the value of project Aesthetics will yield a concomitant increase in

the value of the Re-patronage. The adjusted r^2-value of.398 indicates roughly the contribution of 39.8% by project Aesthetics to Re-patronage. Furthermore, Table 5.44 (ANOVA) indicates that project Aesthetics significantly predict contractor Re-patronage in construction companies in Rivers State (F1, 501=332.745, p=.000)

5.6.6 Relationship between Project Aesthetics and Referral

Table 5.45: Summary of regression analysis on the relationship between Project Aesthetics and Referral

Variable	Mean	Std. Deviation	N
Referral	73.8728	13.28884	503
Aesthetics	74.6282	12.53151	503

Table 5.46: Model Summary on the relationship between Project Aesthetics and Referral

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.756[a]	.572	.571	8.70086
a. Predictors: (Constant), Aesthetics				

Table 5.47: Coefficients[a] on the relationship between Project Aesthetics and Referral

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14.012	2.345		5.975	.000
	Aesthetics	.802	.031	.756	25.884	.000
a. Dependent Variable: Referral						

Rf=14.012+.802As (13)

Table 5.48: Regression ANOVA[b] on the relationship between Project Aesthetics and Referral

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50721.660	1	50721.660	669.991	.000[a]
	Residual	37928.197	501	75.705		
	Total	88649.857	502			
a. Predictors: (Constant), Aesthetics						
b. Dependent Variable: Referral						

Table 5.46 (Model summary) above shows that rp-value of .756 shows a strong relationship between project Aesthetics and Referral. The regression equation (13) (Table 5.47) shows that any increase in the value of project Aesthetics will yield a concomitant increase in the value of the Referral. The adjusted r^2-value of .571 indicates roughly the contribution of 57.1% by project Aesthetics to Referral. Furthermore, Table 5.48 (ANOVA) indicates that project Aesthetics significantly predict contractor Referral within the road construction environment in Rivers State ($F_{1, 501}$=669.991, p=.000).

5.7 Considerations for research question 4

"Can there be a yardstick to measure the possibility of ensuring customer satisfaction from government road construction projects in Nigeria?"

In order to provide answers to RQ4, iterations on the respective attributes of project quality and customer satisfaction as stated in Figure 3.13, and the conceptual framework Figure 3.14 need to be considered. This would be delivered in terms of the framework for improving project quality and customer satisfaction in Government road construction projects and presented in chapter 6.

5.8 Discussion of findings:

5.8.1 Demographics:

The quantitative analysis presented in the previous sections gave an insight into the nature of government road construction projects within Rivers State of Nigeria. The data presentation commenced with a descriptive analysis of the demographic variables and later progressed to the implementation of the statistical method, stepwise multiple regression analysis. Research in construction management such as Assaf, Al-Khalil and Al-Hazmi, (1995); Soetanto and Proverbs (2001); Adenikinju (2003) and Al Nahyan *et al.*,(2012) employed the use of relevant stakeholders and practitioners in the construction industry involving Engineers, Surveyors, Architects, Project managers, etc., to generate primary data for research. Similarly, the demographics from the research affirmed that the respondents were relevant in providing information on issues of project quality and satisfaction in the Nigerian construction industry. A total of 503 respondents participated in the quantitative study and they consisted of Architects (7%), Land surveyors (18%), Quantity surveyors (8%), Engineers (29%), Project managers (5.0%) and a category defined as "others" which included categories not listed in the survey. Within the respondents, 86% had between 0- 10 years of working experience while a larger percentage of the respondents had been or are currently involved with road rehabilitation of state trunk "B" roads involving asphalt finishing. The demographic characteristics therefore indicate the relevance of the selected respondents involved within the survey. The respondents were drawn from construction companies registered with the Rivers State ministry of works and carry out government road construction projects. Within these companies, the simple random sampling, as well as the snowball sampling technique was employed in selecting respondents, giving each relevant respondent an equal opportunity of participating in the research.

5.8.2 Joint contributions of predictor variables to criterion variables:

Saunders *et al.*, (2009) opine that when analysing quantitative data, the nature of the data would determine the analytical method to be employed. This data may be nominal, ordinal, interval or even ratio data. The authors also pointed out that a key feature of quantitative research is the use of statistics to interpret findings. Hence the ordinal data generated in the research was subjected to statistical analysis. Creswell (2009) however identified the type of analysis ordinal data can be subjected to although not restricted to. Consequently, mean ratings and standard deviations of the responses were collated (Tables 5.2- 5.7). The mean

ratings and standard deviations indicated that a high level of awareness existed within the respondents on issues relating to project quality and customer satisfaction. They further affirmed that the items representing the variables of performance, reliability aesthetics, re-patronage and referral were sufficient to characterise project quality and customer satisfaction within government road construction projects in Rivers State of Nigeria.

To investigate the percentage contributions of the attributes of project quality to customer satisfaction, the data were subjected to stepwise multiple linear regression analysis. Stepwise linear regression involves building models and highlighting the relationship between variables through a semi- automatic process (Mark and Goldberg, 1998; Harrell, 2013). Multiple linear regression analysis however aims at fitting a regression line for a response variable using more than one explanation variable. On subjecting the data obtained to stepwise multiple linear regression and considering the variables of project quality, performance was found to be the best predictor of re- patronage (variable of customer satisfaction) 43.1%. Project performance entails the financial and schedule related attributes of a construction project (See figures 3.12 and 3.13) The stepwise multiple linear regression also revealed that performance and reliability accounted for 53.2% of the variance in re-patronage while performance, reliability and aesthetics jointly accounted for 54.8% of the variance in re-patronage. Figure 5.1 models the percentage contributions of the variables of project quality to the variance in re-patronage.

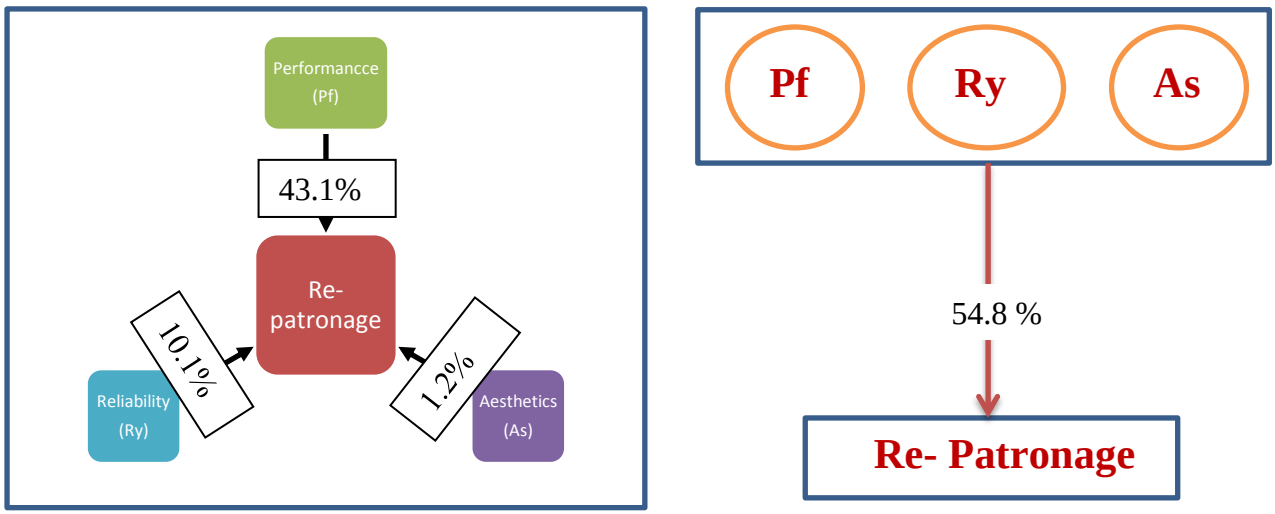


Figure 5.1: Model of percentage contributions of the variables of project quality to the variance in re-patronage.

Where Pf= Performance, Ry= Reliability, As= Aesthetics and Rp= Re- patronage.

The regression equations include

Rp= 20.921+ 0.720Pf……(1)

Rp= 5.816+0.557Pf+ 0.343Ry……..……(2)

Rp= 4.555+ 0.460Pf+ 0.257Ry+ 0.192As. ……...(3)

In addition, the standardised regression coefficients also known as the beta- values for the variables of project quality were positive and > 0. Hence the variables were highly significant to the prediction of the dependent variable, customer satisfaction. Harrell (2013) posits that the beta value, which is measured in units of standard deviation, signifies the strength of the predictor variable in influencing the criterion variable. The higher the beta- value, the greater the impact of prediction. Thus a positive beta value shows strong significance and a negative beta value shows a weak significance, while a zero beta value shows no significance. On the other hand, when considering the other attribute of customer satisfaction, referral, aesthetics was found to be the best predictor of the variation in customer satisfaction, 57.1%. Performance and reliability were found to be weaker predictors of referral (4.7% and 0%) respectively. Figure 5.2 models the percentage contributions of the variables of project quality to the variance in contractor referral.

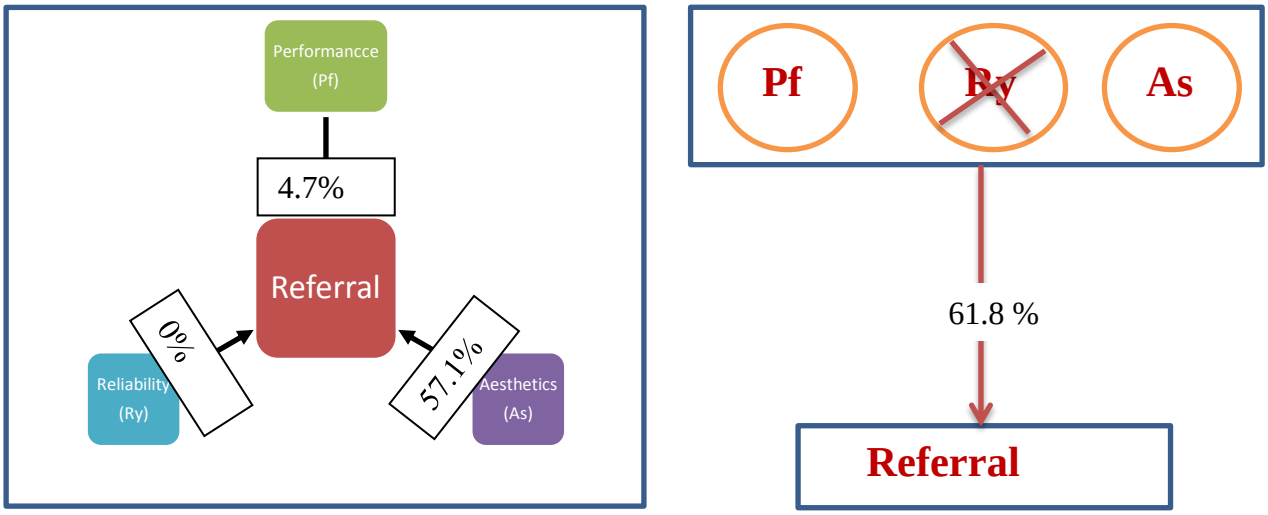
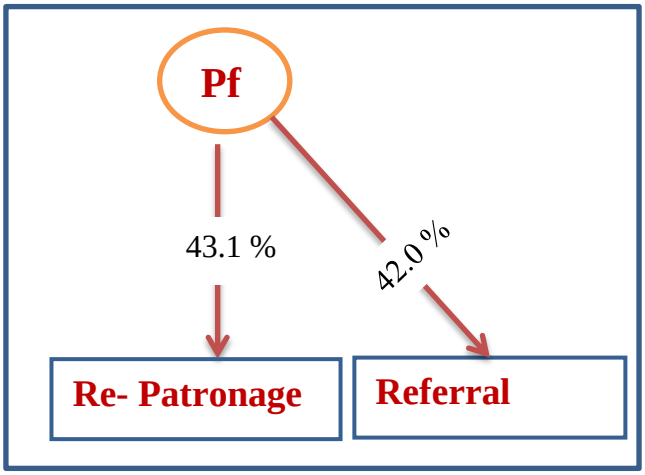


Figure 5.2: Model of percentage contributions of the variables of project quality to the variance in referral.

The standardised regression coefficients (beta- values) for performance and aesthetics were found to be positive and greater than zero, indicating a strong significance of these variables to the prediction of referral. However, the beta – value for reliability was found to be negative and < 0 (- 0.4). This shows that increments in reliability may not necessarily have an effect on the referral of contracting firms in the construction industry, an indication of weak significance to the prediction of referral.

5.8.3 Individual contributions of the predictor variables:

The research further went on to determine the individual percentage contributions of each of the variables of project quality to customer satisfaction when considering government road projects in the Nigerian construction industry in general, and Rivers state in particular. With positive standardised coefficients of regression, performance was found to be responsible for approximately 43.1% of re-patronage and 42.0% of referral on contracting firms to the rivers state government. Figure 5.3 models the individual percentage contribution of performance to re-patronage and referral.



The Regression equations are

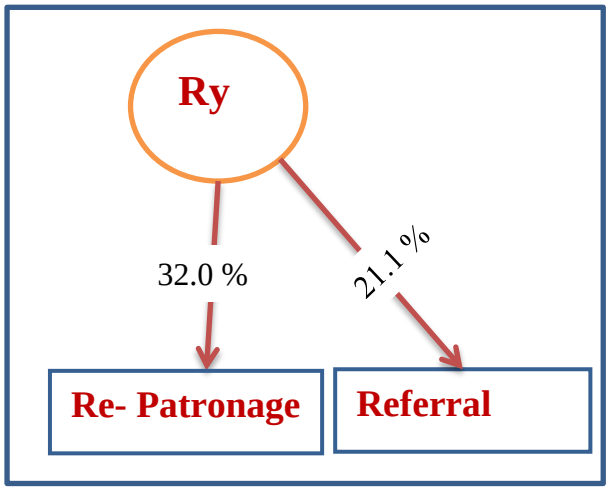
Rp= 20.921+0.720Pf

Rf= 21.449+0.776Pf

Figure 5.3: Individual percentage contributions of performance to re- patronage and referral

The finding suggests and thus affirms that performance is a strong predictor of customer satisfaction and any increase in the constituents of performance would yield a corresponding increase in customer satisfaction within government road construction projects in Rivers state of Nigeria. The individual contributions of reliability to customer satisfaction were also investigated. The regression analysis revealed that project reliability alone accounted for 32.0% of the value of re-patronage and 21.1% of the value of referral.

Similarly, Figure 5.4 models the individual percentage contribution of reliability to re-patronage and referral.



The regression equations include

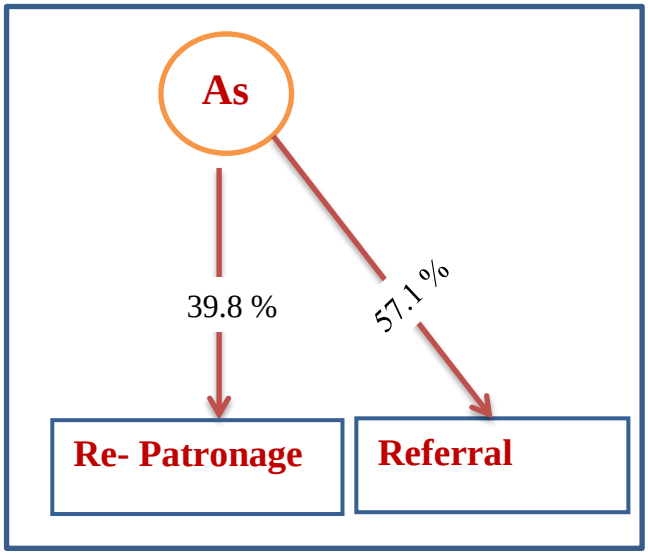
Rp= 27.367+0.553Ry

Rf= 36.393+ 0.491Ry.

Figure 5.4: Individual percentage contributions of reliability to re- patronage and referral

When considered individually, reliability was found to have a positive significance to the prediction of referral, however, when combined as obtained in the stepwise multiple regression, its significance is seen to be weak. This discrepancy could be attributed to the general criticisms surrounding the use of stepwise regression analysis when there exists more than one predictor variable. According to Harrell (2013), biases occur in stepwise multiple regression as the results are usually based on the same data and the number of independent variables affects the results of the final model especially when using the adjusted R^2- values. Hence, individually the contribution of project reliability is visible and positively significant to the prediction of re- patronage and referral when compared to the results from the stepwise multiple regression analysis. Lastly, the regression analysis revealed that aesthetics alone contributed approximately 39.8% of the variance in re- patronage and 57.1% to the variance in referral. With positive standardisation regression coefficients, a strong positive significance existed between the variables of aesthetics and the variables of re- patronage and referral.

Figure 5.5 models the individual percentage contribution of aesthetics to re-patronage and referral.



The regression equations are stated below.

Rp= 23.799+0.613As

Rf= 14.012+ 0.802As.

Figure 5.5: Individual percentage contributions of aesthetics to re- patronage and referral

Similarly, the individual contribution of aesthetics to re- patronage is more visible in this case when compared to the findings from the stepwise regression analysis. This however is one of the criticisms to the use of stepwise regression analysis, hence it is advisable to find individual contributions of the predictor (independent) variables to the variance of the criterion (dependent variable) alongside the stepwise regression analysis to give you a better understanding of the data set and regression analysis in general.

5.9 Inference from findings

From the quantitative data analysis, the following inferences can be made based on the findings from the adopted research methodology.

a. The distribution of demographics indicated that the right people were surveyed for this research. With 503 valid respondents consisting of Architects (7%), Land surveyors (18%), Quantity surveyors (8%), Engineers (29%), Project managers (5.0%) and a category defined as “others” which included categories not listed in the survey, there was a wide spread of knowledge and expertise. In addition, the respondents were conversant with road construction activities within the Nigerian construction industry as 86% of the respondents had between 0-10 years of working experience while a larger percentage of the respondents had been or are

currently involved with road rehabilitation of state trunk "B" roads involving asphalt finishing (Table 5.1 and 5.2) thus providing answers to research question 1.

b. Through the mean ratings and decision table, it can be inferred that the items captured in the questionnaire were vital measures of project quality and customer satisfaction. The results showed that a greater proportion of respondents strongly agreed/ agreed and were highly satisfied/ satisfied with the questionnaire items.

c. Employing the multiple stepwise regression analysis this research was able to quantify the relationship between the independent variable (project quality) and the dependent variable (customer satisfaction). These relationships are expressed in terms of the regression equations and show the corresponding effect of an increase or decrease of any of the variables. Furthermore, the individual contributions of the attributes of project quality to customer satisfaction were explained by the findings from the regression analysis, hence providing answers to research question 3. The individual components of performance, reliability and aesthetics as captured within this research are thus engaged to develop the desired framework for enhancing project quality and customer satisfaction in Government construction projects in Rivers State, Nigeria.

5.10 Chapter Summary:

The quantitative study ensured that it abided by the conditions for adopting a positivist philosophical paradigm. The positivist paradigm held that the researcher was independent of the reality sought and utilized mathematical and scientific tools to draw up inferences from the data obtained (Collis and Hussey, 2009). The statistical tool SPSS aided in organizing and presenting the data obtained from the questionnaire survey and stepwise multi-linear regression analysis aided in establishing the relationships and percentage contributions of the variables in the research. Having identified the significance as well as percentage contributions of the variables of project quality to the provision of customer satisfaction in road construction projects, it is imminent to attempt to develop a framework that would enhance project quality and customer satisfaction from road construction projects within Rivers state of Nigeria. The framework extracts the key characteristics of project quality as contained in the research that would yield the percentage contributions identified or even more. Consequently the framework on validation through structured interviews on selected

construction professionals involved with government road construction projects is hoped to provide a yardstick or benchmark that could ensure or enhance customer satisfaction within road construction projects in the geographical scope of the research.

6. CHAPTER 6: GOVERNMENT ROAD CONSTRUCTION SATISFACTION FRAMEWORK (GORCOS)

The findings from the quantitative study have shown the interrelationships between the dependent variable (customer satisfaction) and the independent variable (project quality). Developed from the conceptual framework, the relationships explained both the joint and individual percentage contributions of each of the variables of project quality to customer satisfaction. In order to establish ways of enhancing customer satisfaction with government construction projects in Nigeria, a questionnaire containing 103 items was designed, surveyed and subjected to statistical analysis. The questions were drawn from literature, while the relationships explored were obtained from the conceptual framework. However, because this research is interested in ways of enhancing customer satisfaction, and the quantitative study has established the contributions of the variables of project quality (Performance, Reliability and Aesthetics), it is essential to extract the individual components of the variables and develop the required framework based on the findings from the quantitative study.

6.1 Framework characteristics:

Miles and Huberman (1994) defined a conceptual framework as the system of concepts, assumptions, expectations, beliefs and theories represented either verbally or graphically. Considering research, the conceptual framework should be one that entails the main things to be studied, the key factors, concepts or variables highlighting the presumed relationships between them. Consequently, a framework entails a basic structure explaining a concept, system or text. Different frameworks have been employed in construction management and traditionally, they conform to the activity box syntax as explained in Bassioni *et al.*, 2004. Figure 6.1 shows an illustration of the activity box syntax.

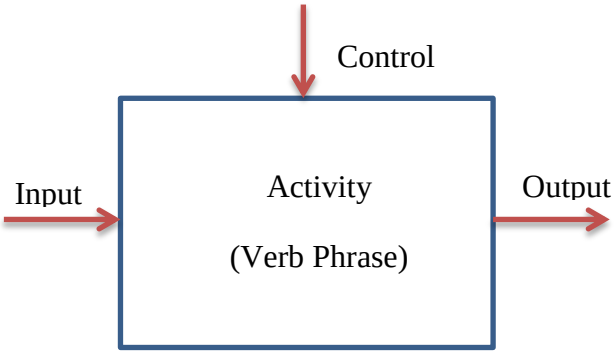


Figure 6.1: Activity box syntax for framework development

Input: this refers to the various activities that are carried out within a particular theme, section or category.

Activity: this refers to the theme, section or category that classifies the input activities.

Output: this refers to the desired outcome from the input activity.

Control: this entails the limitation of the activity and specifies boundaries within which the activities occur.

Bassioni *et al.*, (2004) adopted this ideology in the design of a conceptual framework for measuring business performance in construction. The ideology of the activity box syntax was also adopted by Wang *et al.*, (2004) who developed a construction risk management framework for developing countries. The framework involved identifying key risks and its criticality (input) and providing mitigating measures (output) depending on the nature of the risk (control). Wang *et al.*, (2004) highlight that in the development of the risk management framework, the key findings from the research were incorporated and entailed risk management strategies and procedures (activity) that both international and Singaporean firms could relate to and adopt. Similarly, Succar (2008) opined that a framework may be used to bridge the gap between academic and industrial understanding. Succar (2008) employed the concept of the activity syntax box in the field of Building Information Modelling (BIM) and went on to develop a BIM framework adaptable to the unique requirements of construction and industrial stakeholders.

Having studied the relationship between the variables of project quality and customer satisfaction and identified the key areas of the project life cycle as well as the responsible stakeholders, reference would therefore be made to the items in the questionnaire that enhanced satisfaction. It is however iterated that this research is concerned with ways of enhancing satisfaction, rather than the causes of dissatisfaction.

6.2 Towards the revised conceptual framework:

For purposes of clarity and scope definition, three variables of project quality were selected for investigation. They included the project performance, defined as the financial and schedule related attributes of a construction project; the project reliability defined as the failure- free performance of a project when operated under stated conditions; and the project

aesthetics which refers to the visible physical appearance of the constructed project. These variables were arrived at through categorisation of the various attributes of project quality obtained from the review of relevant literature. Consequently, the constituents of each of these variables were highlighted in the literature review section of this study (See figure 3.12) and extracts from these constituents were used in the questionnaire design. Also, the questionnaire design entailed a Likert scale which had a range of 1 for strongly disagree, 3 for indifferent and 5 for strongly agree. Similarly, the scale in the questionnaire also defined the range for satisfaction, 1 for highly unsatisfied, 3 for indifferent and 5 for highly satisfied. With the adoption of a positivist paradigm, which holds that a quantitative research method should be employed to obtain data, the data obtained should be analysed statistically and provide answers to questions that bother on how much or to what extent (Creswell and Clarke, 2007; Collis and Hussey, 2009), a high importance was placed on items that the respondents either agreed or strongly agreed as well as items that the respondents were either satisfied or highly satisfied with. Through the stepwise multiple regression analysis, the percentage contributions of the variables of project quality (Performance, Reliability and Aesthetics) to customer satisfaction (Contractor referral and re- patronage) were determined. The questionnaire consisted of 103 items which entailed questions drawn from the literature review. Consequently, employing the ideology of the activity syntax box, the analogies expressed above, and drawing inferences from the stepwise multiple regression analysis, a revised conceptual framework is developed and presented in figure 6.2. The percentage contributions otherwise known as the variance of the dependent variable (project quality) to the independent variable (customer satisfaction) are however presented in the reviewed framework.

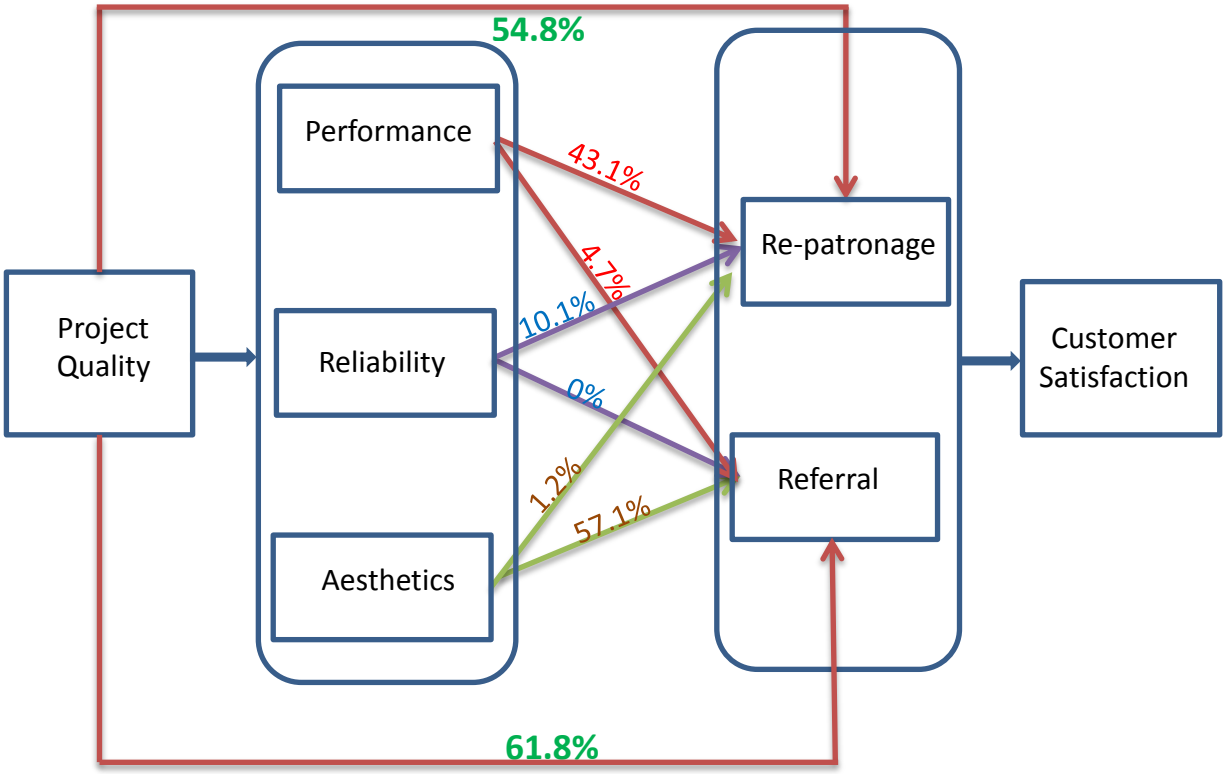


Figure 6.2: Revised conceptual framework

According to Osborne and Waters (2002), there exist four key assumptions when modelling from a multiple regression analysis. While modelling from a regression analysis, it is assumed that the variables are normally distributed (Tabachnick and Fidell, 2000; Osborne and Waters, 2002). In other words, it is assumed that the variables are not highly skewed, kurtotic or substantial outliners as these can distort relationships in the model. Osborne and Waters (2002) further highlight that visual inspection of data plots, skewness and P-Plots could inform the researcher on the normality of the data. Secondly, in modelling from a multiple regression analysis, it is often assumed that there exists a linear relationship between the independent and dependent variables (Osborne and Waters, 2002). It is believed that the true relationship of the independent and dependent variables would be undermined if there exists no linearity between the variables. Another key assumption when modelling from a multiple regression analysis holds that measurements of the variables are reliable, that is measured without error. Unreliable measurements lead to underestimation of the relationships between the variables understudied. Osborne and Waters (2002) opine that in the case of multiple regression or partial correlation, effect sizes of other variables can be over-estimated if the covariate is not reliably measured, as the full effect of the covariate(s) would not be

removed. When modelling, the key concern is to effectively model the true relationships, hence the introduction of the Cronbach's alpha, an indication of the reliability of the data obtained when obtaining measurements on the variables understudied. Lastly, it is assumed when modelling from a multiple regression analysis that "*Homoscedasticity*" exists between the variables examined and across all levels of the data set. Homoscedasticity implies that the variance of errors is the same across all levels in the regression analysis. Consequently, Berry and Feldman (1985) and Tabachnick and Fidell (1996) cited in Osborne and Waters (2002) admit that the opposite of Homoscedasticity, "*Heteroscedasticity*" could lead to massive distortions of the findings from the regression and hence affect the model developed. They however add that heteroscedasticity has little or no effect on the results of significance tests carried out on the data obtained. According to Osborne and Waters (2002) a visual examination of the standardised residuals and the standardised regression value could give an indication of the homoscedasticity of the variables. The assumptions highlighted above are standard practices to be observed when modelling from a multiple regression analysis and the results obtained and presented in the previous chapter have been inspected for alignment and conformance to the assumptions. Hence, out of the 103 items in the survey, responses with mean scores of 3.5 and above have been selected for model development. It is believed that these items characterise the enhancement of customer satisfaction from the road construction projects in Rivers State, Nigeria. In addition, research according to Garland (1991) provides evidence that the presence or absence of the mid-point distorts information as respondents try to please the researcher through their responses. Garland (1991) further adds that in the absence of the mid-point, respondents are forced to make a choice which either agrees or disagrees on the issue in question, thereby having responses in favour of an issue agreeing or strongly agreeing and those not in favour disagreeing or strongly disagreeing. Hence, when utilising a Likert scale of 5 (for example 1 for strongly disagree and 5 for strongly agree) to rate responses especially when the mid- point 3 signifies indifference, items with mean ratings above 3.5 either signify "agree" or "strongly agree" as evidenced in the data presentation in chapter 5. It should however be noted that items with mean scores less than 3.5 do not necessarily cause dissatisfaction, but may have low or insignificant levels of satisfaction, hence our concentration on items with mean ratings of 3.5 and above. Table 6.1 presents the items from the survey that was highlighted to have mean ratings of 3.5 and above.

6.3 GORCOS Framework Development

6.3.1 GORCOS development for performance attributes:

In order to develop items for the framework concerning performance attributes the responses with mean scores greater than 3.5 are highlighted in Table 6.1 below. The items are seen to be essential to provide a greater percentage of the 43% contribution to re-patronage and the 4.7% contribution to contractor referral.

Table 6.1: Performance attributes that enhance customer satisfaction

SN	Performance	Mean	SD
1	Construction site personnel work in teams	**3.9642**	**1.08902**
2	Contractors prefer quality to cost	3.5030	1.20569
3	The government body which awards a contract prefers quality to cost	3.8429	1.13492
4	Customers (road users) prefer quality to cost	**4.1392**	**1.27515**
5	The client (government) determines the project design	3.5905	1.25259
6	The road construction projects adequately meet the commuting needs of the customers	3.5785	1.26762
7	Road projects are supervised by qualified government staff	3.5368	1.31121
8	Government officials delegate supervisory responsibilities	3.5030	1.36967
9	Road projects are executed with delays due to the clients' inability to meet the contract financial terms	3.6163	1.30349
10	Indigenous road construction companies are patronised by the government.	3.5308	1.38811
11	Contractor re- patronage for excellence is guaranteed by the client.	3.6421	1.30703
12	Road construction companies enjoy high level referral by their clients, the Government.	3.5865	1.31645
	Poor project performance indicators:		
13	Client's inability to make scheduled payments to contractors.	3.6143	1.22651
14	Project abandonment due to low cash flow	**3.9761**	**1.22370**
15	Incessant project abandonment and restarting	3.5964	1.00900

The questionnaire items selected under the variable of project performance can further be categorised according to the reoccurrence of ideas within the variable. According to Given (2009), categorisation involves attempts to group patterns observed in data into meaningful units or categories. Given (2009) further highlights that categories are formed by bringing together groups of similar data based on the similarities between them as observed by the

researcher. Hence, issues such as improved project funding, improved scheduled payments as well as the preference of quality to cost can be categorised under the broad heading of project cost. Consequently, table 6.2 presents a summary of the categorisation of the survey items when considering the variable of performance.

Table 6.2: Categorisation of constituents of performance in Government road construction projects

S/No	Category	Survey items selected	Constituents
1	Cost	2, 3, 4, 13	Preference of quality to cost, prompt scheduled payments, improved project funding.
2	Clear client brief	5, 6	Improved understanding of project design, implementation of customer needs.
3	Competent experts	7,8	Project supervision, improved project monitoring, use of qualified indigenous contractors/ companies.
4	Adequate legal framework	20, 23	Scrutiny in contract award process, referral based on past performance, penalties for project abandonment.
5	Project abandonment	14	Enforcing project risk analysis.

6.3.2 GORCOS Framework development for reliability attributes:

Project reliability was defined as the failure- free performance of a project when operated under stated conditions and the questions in the survey were centred on the perceived failure of constructed roads within the geographical scope of the research. Similarly, categorisation was employed to the items in the variable of project reliability, outlining the items with mean scores of 3.5 and above. Table 6.3 presents the items of reliability that respondents affirmed were responsible for offering higher satisfaction from government constructed roads.

Table 6.3: Reliability attributes that enhance customer satisfaction

SN	Reliability	Mean	SD
16	Contractors conform to designed specification	3.8072	1.14514
17	Project designs contain sufficient details	3.8449	1.11304
18	Road projects should be procured on a 'build and maintain' basis.	3.9304	1.28318
	Professional expertise should be utilized:	**Mean**	**SD**
19	Project design	4.0358	1.32953
20	Project management	3.9642	1.26346
21	Project auditing	3.8986	1.38131
22	Financial management	**4.0736**	**1.23065**
23	Quality control	3.9920	1.22553
24	Construction equipment operation	**4.0676**	**1.18397**
	Opinion on issues pertaining to project reliability:	**Mean**	**SD**
25	Contractors exhibit improvements from past projects	3.8827	1.12033
26	Clients (Government body) monitor contractors closely to deliver project.	**4.1312**	**1.17013**
27	Defects are addressed before project handover	**4.0278**	**1.07081**
28	Spontaneous inspection should be carried out by top Government officials	3.9702	1.32743
29	Community leaders should be involved with road inspections	3.6461	1.42893
30	The Government body should enforce strict penalties for health and safety regulations violation.	3.9284	1.13389
31	Health and safety considerations by contractors are top priority from planning to execution	3.7296	1.37220
32	The knowledge of reliability (non- failure within given time) from past projects influences referral	3.9881	1.20418
33	The judgment of the project users through post project evaluations influences re- patronage by the client (government).	3.5089	1.37400

The items in the variable of project reliability were further subjected to categorisation and summarised into headings. These headings were selected based on the similarities in the items as well as the relevance to the research problem and model development. Table 6.4 presents the categories as well as the constituents of the categories based on the items in the survey carried out.

Table 6.4: Categorisation of constituents of performance in Government road construction projects

S/No	Category	Survey items selected	Constituents
6	Road maintenance	18	Enforcing the construct and maintain strategy
7	Professional expertise	19, 20, 21, 22, 23, 24	Project design, project management, auditing, managing finances, quality assurance and quality control, construction equipment operation.
8	Project monitoring	25, 26, 27, 28.	Random project inspection, defect detection before handover, Nature of feedback from past projects, involvement of local community leaders in road inspection.
9	Health and Safety considerations	30, 31	Penalties for HSE violations, strict adherence to HSE provisions.
10	Post project evaluations.	32, 33	Time to road failure to determine re-patronage and referral of contractor.

6.3.3 GORCOS Framework development for project aesthetics attributes

Project aesthetics was viewed as one of the vital but controversial attributes of government road construction projects within the Port Harcourt metropolis of Nigeria. Defined as the visible physical appearance of the constructed project, the project aesthetics entails the tensile strength of the constructed road (determined from the Civil Engineering aspects of road construction) to the nature of the finishing and physical appearance of the constructed road on completion. Again, the items in the questionnaire were carefully selected to cater for the demands of project aesthetics in relation to the offering of satisfaction. Hence the items that the respondents affirmed were responsible for offering more satisfaction was highlighted and these included items with mean scores of 3.5 and above. Table 6.5 presents an overview of the items that were selected and a further categorisation of the items was carried out. The similarities in the items were the major determinant for the categorisation.

Table 6.5: Aesthetic attributes that enhance customer satisfaction

SN	Aesthetics	Mean	SD
34	The Government body which awards the contract insist on using standard approved materials only	**4.2028**	**1.24756**
35	Contractors adhere to the ISO standards they subscribe to in carrying out construction jobs	3.6759	1.30291
36	A Condition of the contract award entails strict adherence to quality standard implementation	**4.2187**	**1.02162**
	Modern technology is utilised in road construction:		
37	Information Technology	3.8926	1.20936
38	Automation of construction equipment e.g. programmable concrete mixers.	**4.1412**	**0.96655**
39	Knowledge management particularly the sharing of information from top management to bottom staff	4.0000	1.09144
40	Traffic simulations	3.9503	1.09304
41	Mechanisation instead of manual labour	4.1650	1.021
42	In the Surveillance of project against vandals	4.0855	1.09991
	Opinion on project quality issues pertaining to aesthetics:		
43	Government road projects contain excitement factors otherwise called "Artistic Inventions"	3.7948	1.51020
44	Project designs are uniquely adapted to the project environment	3.7555	1.19504
45	Project beauty does not undermine its efficiency	**4.0477**	**1.16801**
46	Nature of road aesthetics can determine contractor re- patronage	3.8290	1.16326
47	Aesthetic quality of finished road influences contractor referral.	3.7913	1.11766

Similarly, categorisation of the survey items on aesthetics that seemingly enhanced satisfaction was carried out. Common and similar terms were grouped under headings to define the characteristic of aesthetics that could be directly input into the model for satisfaction from government road construction projects. Table 6.6 presents the categorisation of the attributes of aesthetics as obtained from the questionnaire survey.

Table 6.6: Categorisation of aesthetic attributes from survey.

S/No	Category	Survey items selected	Constituents
11	Standardization	34, 35, 36	Ensuring the use of companies with relevant ISO certifications Use of standard approved materials
12	Advanced Technology	37, 38, 39, 40, 41, 42	Simulation of traffic flows Ensuring the use of mechanised labour CCTV surveillance post-handover Fluidity in communication between hierarchy Documentation of approvals, drawings and information.
13	Presence of excitement factors	43, 44, 45, 46, 47	High benefit cost ratio of project Introduction of "state of the art" designs Constructing beautiful but rigid roads High taste of project finishing that does not undermine its efficiency.

Consequent to the categorisation of the items perceived to enhance satisfaction in government road construction projects in Rivers State, Nigeria, 13 broad headings have been developed. These include the knowledge and analysis of the construction **costs**, the presence of a clear and succinct **client brief**, the use of **competent experts**, the provision of an **adequate legal framework** as well as an analysis of the factors that could lead to **project abandonment.** In addition, the delegation of responsibility for **road maintenance,** the use of **professional expertise**, **project monitoring**, **health and safety considerations**, enforcing the use of **standard materials** and ISO certified firms, update on the use of **advanced technology** as well as the presence of **excitement factors** were consequently highlighted as conscripts for the GORCOS. Issues such as the use of competent and/ or professional expertise, as well as

provision of a clear client brief can be attributed to the skill of the construction expert and thus can be grouped into one heading. Similarly, the issue of standardisation can be embedded in the conscripted legal framework, thereby leaving 10 key aspects of a road construction process that are perceived by construction professionals to enhance the project quality and the satisfaction obtained from the finished project. Table 6.7 highlights the constituents of the items used in developing the GORCOS.

Table 6.7: Categorisation of framework variables

Project phases			
Conceptualisation	**Planning**	**Execution**	**Termination**
Cost breakdown	Professional experts	Project Monitoring	Project maintenance
Risk analysis	Advanced technology	Excitement factors	Post- Project evaluations
Legal framework			

Furthermore, adopting the activity box syntax, the "*input*" themes would be the various activities as captured from the literature review and questionnaire items bothering on performance, reliability and aesthetics of government road construction within Nigeria. The *"output"* themes would include customer satisfaction highlighted through contractor referral and re- patronage, while the *"activity"* would entail the 10 contextual themes developed from the data analysis. The *"control"* would entail the different phases of construction embedded in the project life cycle. Figure 6.3 therefore presents the Government Road Construction Satisfaction Framework GORCOS.

GOVERNMENT ROAD CONSTRUCTION SATISFACTION FRAMEWORK (GORCOS)

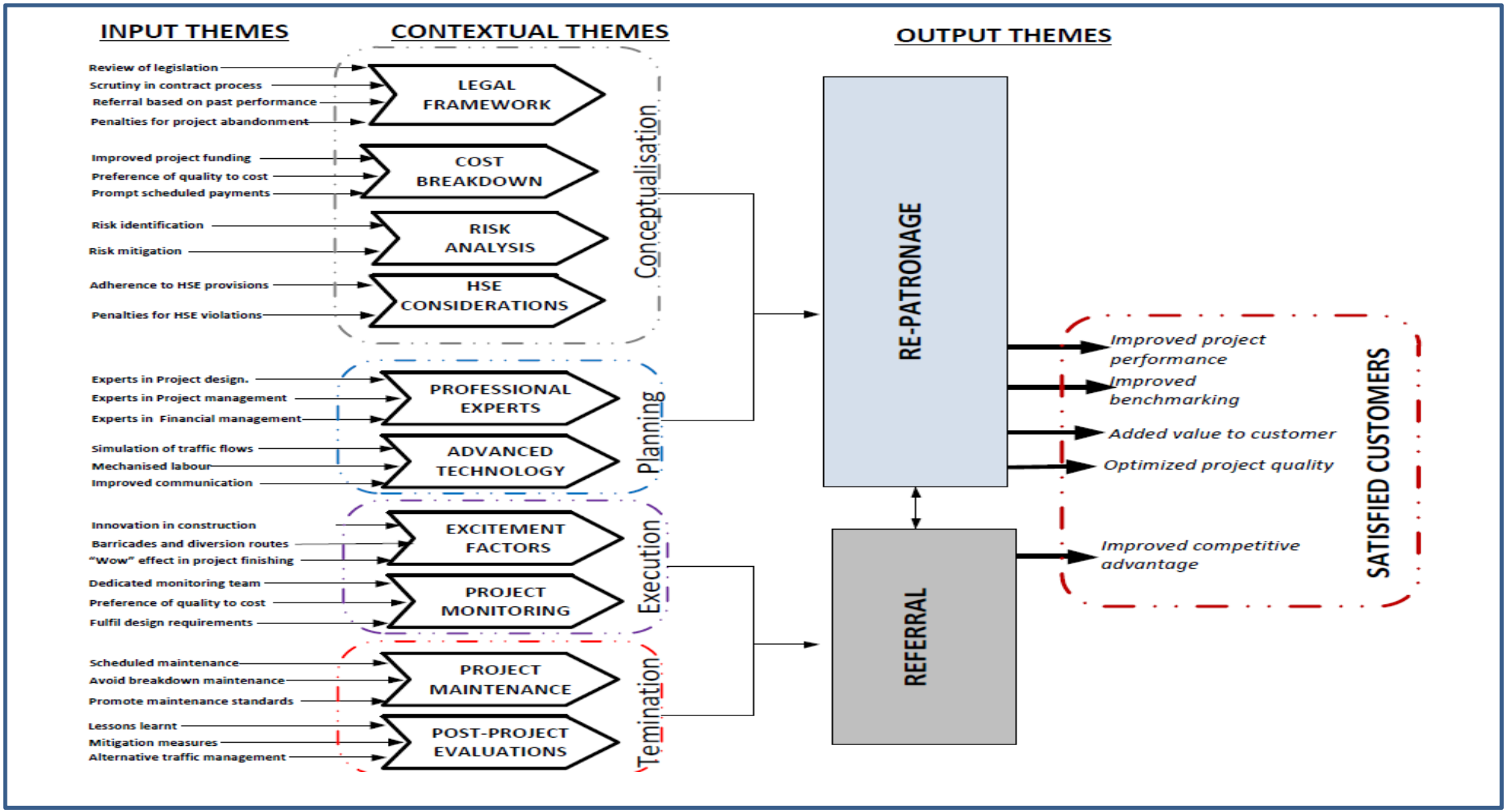


Figure 6.3: Government Road Construction Satisfaction Framework

7. CHAPTER 7 GORCOS VALIDATION

7.1 Introduction

The aim of this research was to develop a framework that would identify critical pathways of project quality where adequate resources could be channelled in order to enhance customer satisfaction in government road construction projects in Rivers State, Nigeria (Chapter 1). This aim has been achieved and the preceding chapters have shown the chronological progressions that arrived at the framework (Figure 6.3). This framework however needs to be validated to ensure that it is fit for purpose and alleviates the needs of the research beneficiaries.

This chapter seeks to validate the developed framework by means of a qualitative survey and review the other validation processes carried out in the course of this research. Structured interviews were carried out on selected construction practitioners and the results of the validation are presented.

7.2 Definition of validity

Validity is defined as a means of measuring how truthful research results are Golafshani (2003). In other words, validity aims at finding out the accuracy of the research, and if the findings are a true representation of what was initially set out to find. Validity could also refer to the degree to which evidence and theory support the interpretations of findings Morse et *al.*, (2008). Golafshani (2003) opines that researchers generally determine validity by asking series of questions and compare results with other existing similar research. The term validity is often associated with reliability or replicability of research, even though these concepts underpin the issues associated with validity. However, in an ideal situation such as in the construction industry, research findings are usually exclusive to the particular research situation. Replicating research findings may not always be possible due to the evolving and dynamic nature of needs and demands, the uniqueness of individual construction projects, as well as the unavailability of similar respondents.

7.2.1 Validation approaches in research

In research, there exist various approaches to validation. Literature according to Babbie (1990); Nanda *et al.*, (2000); Golafshani (2003) and Morse *et al.*, (2008) suggest that validation approaches may include content, face, construct, internal, statistical and external. Table 7.1 summarises the different validity approaches and makes reference to the content in this research.

Table 7.1: Validity approaches in research

Validity approach	Definition	References	Reference to research
Content	Also referred to as logical or rational validity indicates the extent to which a measure represents all facets of a given social construct.	Nanda *et al.*, (2000)	Pilot study Chapter 4 (4.11.4.1)
Construct	How appropriate a simplified version of a problem is such that the problem of interest can be solved	Morse *et al.*, (2008)	Literature review Chapters 2 and 3
Statistical	This refers to the possibility of drawing conclusions of inferences on the relationship between two or more variables in agreement with statistical or scientific laws	Morse *et al.*, (2008)	Stepwise multiple regression analysis and discussion of findings. Chapter 5 and 6
Internal	The extent to which assertions can be made on the effect of variables studied on the outcome of research findings. In other words affirming that no other variables would have produced such outcome.	Nanda *et al.*, (2000); Morse *et al.*, (2008)	**Not available
External	This refers to the extent to which findings from a research can be generalised to others within the same social construct.	Nanda *et al.*, (2000)	Research audience, respondents and beneficiaries stated in chapter 1.

In the course of this research, various aspects of validation have been carried out except for the internal validation which is the basis of this chapter.

7.2.2 Internal validation

Internal validity refers to the extent to which assertions can be made on the effect of variables studied on the outcome of research findings (Nanda *et al.,* 2000; Morse *et al.,* 2008). In other words carrying out internal validity aids in affirming that the inputs were responsible for the observed outputs and that no other variables would have produced such outcome. The importance of internal validity is based on the fact that despite ensuring the content, construct and statistical validity, it may be impossible to know the magnitude of unknown factors that influence the findings of interest. Hence, the intended or expected results may not be produced. Whereas (Winter, 2000) argues that validity is not a feature of a particular methodology (quantitative and qualitative), there is dire need to show how representative and justifiable the research findings (the framework in this case) are. Internal validity however offers researchers the confidence to conclude that what was done in the course of the study produced the observed results and it is usually employed when the need is to link a cause with an effect. Research according to Proverbs (1998) and Xiao (2002) adopted a strategy which involved the search for convergence between the three aspects of published research, research findings and academic validation. They opined that if convergence was demonstrated, then arguments made on the basis of the findings of the research were valid, indicating that good internal validity was achieved through the research design. Consequently, triangulation which is defined as "*a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study"* (Creswell and Miller, 2000:126) was adopted as a means of carrying out the validation of the internal components of the GORCOS.

7.3 Framework validation

Bryman (2004) refers to triangulation as the use of more than one approach to the investigation of a research question in order to boost the confidence of the research findings. Several researches in the social sciences and construction management in particular have employed triangulation to buttress the robustness of their research and justify their findings (Todd, 1979; Seymour *et al.,* 1997; Love *et al.,* 2002 and Jack and Raturi 2006). Consequently, in order to validate the GORCOS, a qualitative research method was employed to complement the original quantitative research method utilized in this research. This method was suitable as the need arose to explore in-depth the constructs of the framework

and determine if the input themes which were obtained from project quality (performance, reliability and aesthetics) were responsible for the output themes of customer satisfaction (re-patronage and referral) through the contextual themes developed from the quantitative study. 10 structured interviews containing 10 questions (Refer to Appendix) were carried out and the respondents included 3 Project Managers, 2 Architects, 3 Civil and Structural Engineers, one Surveyor and one road user with appreciable knowledge on road construction projects in Nigeria. The sample ensured that a "*good-mix*" of respondents were surveyed and were a representation of the participants for the quantitative survey initially carried out. The interview questions were drawn from the framework and screened for clarity (content and construct validity) through iterations between the researcher and the supervisory team.

Prior to the interview, a copy of the framework had been distributed to the respondents to incite their thoughts. The respondents were also informed on their right of participation, the confidentiality of information and their consent to record (audio) the interview was obtained. Each interview lasted for about 35 minutes and the respondents were given codes SF1 to SF10. The findings which are a summary and in some instances direct quotations from the respondents are presented under the sections of conceptualisation, planning, execution and termination.

7.3.1 Interview responses for conceptualisation

The conceptualisation phase entails the development of the initial goal and technical specifications for the project. It involves laying out modalities to decipher if the project can be achieved or not. With respect to the framework, four contextual themes are categorised within the conceptualisation phase and they are; Legal framework, Cost breakdown, Risk analysis and HSE considerations. The interview elicited ideas on the opinions of the respondents on these aforementioned issues. The respondents admitted that within the Nigerian construction industry, there existed several laws and legislation that would enhance the quality of construction projects and satisfaction but lacked the appropriate implementation means. SF2 opined that the legislation was however obsolete and not practical in modern construction practice. SF5 on the other hand opined that construction firms who did not deliver the agreed projects should be exempt from further government construction jobs but attributed poor project performance on the part of contractors to the unpredictable nature of funding experienced while carrying out government road construction

projects. SF3 was of the opinion that project funding was essential for both quality and satisfaction as the nature of project completion was influenced by the available funding at the contractors' disposal. The respondents advocated for a milestone payment plan to be incorporated into the contract award adding that satisfaction can only be achieved if emphasis was placed on quality rather than costs. Considering health and safety, SF1 categorically stated that it was merely a philosophy rather than an activity or way of construction life and added that more needed to be done to ensure the health and safety of both the contractors and the customers during and after road construction projects. The respondents further called for a visible penalty for project abandonment and HSE violations albeit after a transparent inquiry.

7.3.2 Interview responses for Planning

The planning phase involves the development of detailed specifications, schematics and schedules associated with the construction project while establishing a communication plan and modalities for knowledge sharing and management. In the framework, the contextual themes categorised within the planning phase included Professional experts and Advanced technology. The respondents agreed with the need for employing the services of professional experts for project design, project management, financial management, conflict resolution, equipment operation, Engineering and Survey related activities and government liaison. The use of professional experts was seen as a measure for both quality and accountability but the respondents wondered if the use of such experts would be practicable as contractors were usually in business to make profit and may not be able to willingly pay for such expert services. SF3 highlighted the multi- talented operation of construction practitioners within the Nigerian construction industry where for example and Architect could also be the project manager, supplier, or Civil Engineer. Both SF2 and SF9 opined that even if the use of experts in these respects were included in the contract award process, an implementation structure had to be in place to ensure conformance while attracting penalties for non- conformance. The respondents were however of the opinion that satisfaction from the use of advanced technology within road construction projects in Nigeria is still at infancy. Although there have been advancements in the use of mechanised equipment, other areas such as communication, signing and lighting, pedestrian crossing, surveillance which include speed cameras and CCTV as well as breakdown recovery have been underdeveloped. SF3 called for the development of a mobile application that could be used to share information and inform

relevant authorities on construction practices (good or bad), dilapidating roads, broken down vehicles or even the need for a new road.

7.3.3 Interview responses for execution

The execution phase of road construction projects entails the actual physical work as outlined in the project plan. This phase is seen as a key stage for satisfaction as it transforms the planned activities into visible concrete construction. Two distinct contextual themes were categorized under the execution phase and they include; Excitement factors and Project monitoring. The excitement factors are vital for satisfaction as they include both architectural and artistic innovations incorporated into the road construction process, which although are appealing to the eye, should not be compromised for quality or strength. In addition, excitement factors entail the innovative approaches employed while carrying out road construction to manage the movement of vehicles and pedestrians. Respondent SF1 applauded the improvements in innovative approaches to road construction especially in design and construction management in areas such as Abuja and Lagos in Nigeria, but within the Port Harcourt metropolis, the roads were quite basic and standard. Similarly, SF8 decried the "*basic*" nature of road construction projects within the research geographical scope adding that they lacked the *"wow- effect"* experienced when visiting other cities and economical hubs. The respondents agreed that customers to road construction projects would be excited to see alternative measures such as substitute roads, diversion signs, and alternative pedestrian walkways in place while on-going road construction continued. Respondent SF10 highlighted that the absence of both an accountability measure and a dedicated project monitoring team was responsible for dissatisfaction from road construction projects. SF10 further called for the establishment of a legally empowered project monitoring team, made up of professionals in road construction that would checkmate the activities of contracting firms and ensure that what was designed is executed and thereby guarantee value for money spent on road construction.

7.3.4 Interview responses for termination

The termination phase involves relieving resources, contractor and supplier contract termination as well as communication of project completion to stakeholders. The lessons learnt are also evaluated and input into plans for future projects. Consequently the contextual

themes highlighted in the termination phase included Project maintenance and Post-project evaluations. The respondents highlighted that the issue of road maintenance has been a perpetual problem within the Port Harcourt metropolis and it was attributed to the nature of contractual agreements, the political dynamics, percolating water stemming from blocked drains and undefined responsibilities. SF3 pointed out that it was inherent in the mentality of construction practitioners to practice breakdown maintenance and called for a change in mentality. SF3 says *"we should not wait for our roads to be impassable before we swing into action; these roads give signs and should be addressed before a final break down"*. When asked about the effect of scheduled maintenance, respondents SF1, SF5 and SF7 opined that it entailed both economic and psychological benefits. Whereas SF5 highlights that carrying out scheduled road maintenance would ensure the free flow of vehicles and commuters hence ensuring a steady business environment, SF1 sees a psychological boost in the road users (customers), knowing that their taxes are being put to useful work for their benefit. SF1 and SF8 however identify the lack of a feedback mechanism within the framework where lessons learnt and the findings from the satisfied customers could be used to update and improve on the existing framework.

7.4 Convergence of research findings to published research and academic validation

In order to further exhibit the robustness of the findings and validation, a convergence of the research findings to published research and the academia is presented. This is essential to research as Khan and VanWynsberghe (2008) opine that knowledge is created only when the results of a single study have been compared with other similar studies. In this research the findings from the quantitative study (presented through the GORCOS) have been validated using qualitative research methods (interviews). The findings suggest that in order to enhance project quality and customer satisfaction in Government road construction projects appropriate attention needs to be given to the contextual themes in the framework.

7.4.1 Convergence in the conceptualisation phase

The conceptualization phase of the framework consisted of themes involving a vibrant legal framework for Nigerian construction projects, a thorough cost breakdown, risk analysis, as well as health and safety considerations. Whereas the interviewed respondents support these themes, Aibinu and Jagboro (2002) and Akintoye *et al.*, (2003) highlight the importance and

thus relevance of cost to project quality and satisfaction in construction. Also, Baxendale and Jones (2000) addressed the problems associated with implementing the construction design and management regulations in the UK, thus highlighting the importance of a reviewed legal framework for the Nigerian construction industry. Literature on the cooncetualisation phase documented in section 2.12.3 suggests that the phase involves the identification of a reesearch problem or need to exploit an opportunity. Consequently a feasibility study is carried out to ascertain if the preferred solution to the research problem is feasible, the associated costs reasonable, the associated risks acceptable with mitigation plans and avoidance of accountability issues (Westland, 2006). These issues identified from literature are also in tandem with the findings detailed in the input themes for the framework, further butressing the importance and thus relevance of the framework. Baxendale and Jones (2000) further examined the review of legislation with health and safety professionals thus butressing the importance of both health and safety and a legal framwork in construction. Hence the results entailed in the conceptualisation phase of both the quantitative and qualitative study are already captured in literature and are significant requirements for enhancing project quality and customer satisfaction.

7.4.2 Convergence in the planning phase

The planning phase of the GORCOS highlighted conceptual themes involving the use of professional experts and advanced technology while carrying out road construction projects in Nigeria. The findings from the ten interviews on construction practitioners suggests that these themes were highly supported as other areas that required advanced technology were highlighted such as the development of a mobile application for road users. Literature according to Aniekwu (1995) and Leung *et al.*, (2008) support the importance of technical experts. Similarly, Obunwo *et al.*, (2013) identified technical experts as an attribute of quality management which was vital for satisfaction in Nigerian construction projects. It is therefore evident that enhancing project quality and customer satisfaction can be obtainable by utilising technical experts in construction activities.

7.4.3 Convergence in the execution phase

The execution phase of the GORCOS entailed contextual themes bothering on the presence of excitement factors and project monitorng. Whereas 8 of the interview respondents

observed a low level of excitement factors in road construction projects in the study areea, Port Harcourt, Nigeria, they advocated the implementation of a dedicated project monitoring team. The execution phase documented in section 2.12.5 entails the actual building or constructio of the deliverables, monitoring and control of the construction activities as well as phasal reviews of constructed work (Westland, 2006). Consequently, there exists a relationship between the findings entailed in the framework and the requirements for the project execution phase of construction projects.Chen and Chuang (2008) highlighted the importance of excitement factors to satisfaction stating that customers usually evaluate the quality of a product or service using various factors, one of which is excitement. Conklin *et al.*, (2004) on the other hand captures the key drivers to satisfaction which includes fulfilling the set out design requirements. Consequently, with convergence of research findings from both qualitative and quantitative studies of the themes associated with the execution phase with literature, the items therein are valid precursors of project quality and customer satisfaction in construction.

7.4.4 Convergence in the termination phase

The termination phase involved contextual themes centered on project maintenance and post project evaluations. The responses from all the interviews on construction practitioners carried out highlighted that there needed to be a mechanism for knowledge management and transfer, improving on past performances from current construction activities. Liu (1999) highlighted the advantages of post project evaluations through the post- occupancy model. The model however included a feedback mechanism which was lacking in the GORCOS but its capture in literature affirms that the post- project evaluation theme was vital to ensuring satisfaction. In addition, promoting maintenance standards as well as practicing scheduled maintenance over breakdown maintenance was also a valid precursor for project quality and satisfaction from road construction projects in Nigeria (Eadie and Graham, 2014).

Consequently, a revised version of the GORCOS was developed to accommodate the inputs from the interviews with construction practitioners within the Nigerian construction industry and presented in figure 7.1.

Modified Government Road Construction Satisfaction Framework (GORCOS)

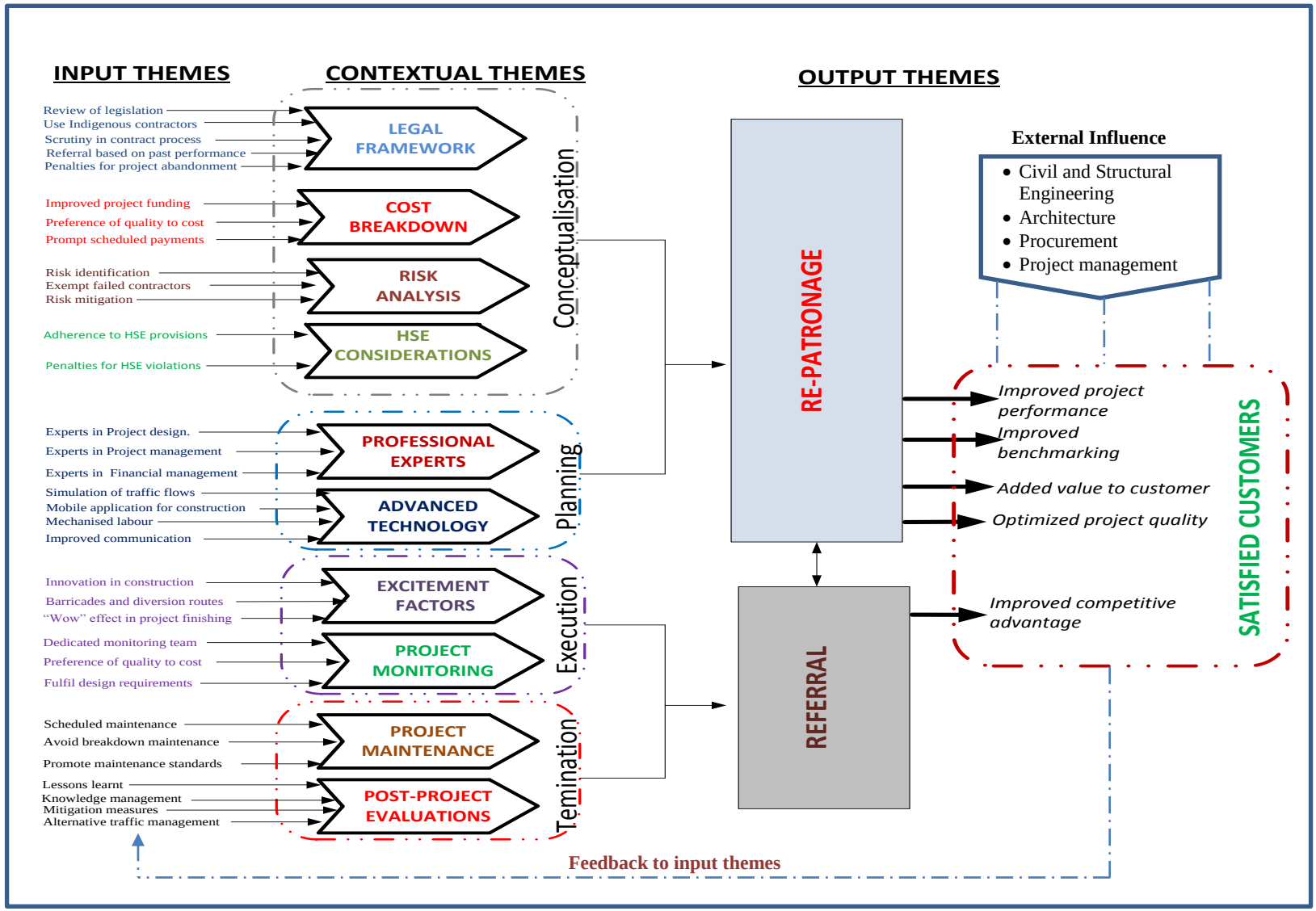


Figure 7.1:Modified Government Road Construction Satisfaction Framework (GORCOS)

7.5 Academic validation of research findings

While carrying out research, it is essential to disseminate information to a wider academic environment and subtle ways of doing this is through academic research publications, conferences and symposia. These methods allow for a wider range of knowledge sharing and information exchange, as valid feedback from experts within the researchers' field could be obtained. The procedure for publication in academic journals involves a review and assessment of the content and validity of such research by an independent assessor who is usually an expert in the field of inquiry. Consequently, feedback is provided and depending on the nature of the feedback the publication is either accepted with minor or major corrections or out rightly rejected.

Consequently, two conference and one journal publication have been made from the findings in the research. These publications were refereed and peer reviewed and was published at;

- International post-graduate researchers conference (IPGRC, 2013)
- International Journal of Engineering, Science and Management (IJESM, 2014)
- Association of Researchers in Construction Management (ARCOM, 2015)

The feedback obtained from these publications has significantly enhanced the research journey especially in the choice of research methodology. A total of 83 articles were cited in these publications indicating an average of 26 articles per publication. Considering the cited references, it can therefore be stated that acceptance of these papers for publication is an indication of the academic validation of my research findings as explained in Ankrah (2007).

Table 7.2: Research publications and references cited

No	Research publication	Year	Number of references cited
1	Obunwo, Chinyio and Suresh	2013	39
2	Obunwo, Chinyio and Suresh	2014	29
3	Obunwo, Chinyio and Suresh	2015	15
Total			83
Average			**26**

The citations for the published articles are given below.

Obunwo, C. Chinyio, E. and Suresh, S. (2013). Quality Management as a Key Requirement for Stakeholders' Satisfaction in Nigerian Construction Projects. *Proceedings from the 11th International post graduate research conference,* University of Salford, Manchester; Pp 723-734.

Obunwo, C. Chinyio, E. and Suresh, S. (2014). Quality management practices and customer satisfaction antecedents in government construction projects. International Journal of Engineering, Science and Management **4**(4). Pp 105-111.

Obunwo, C, Chinyio, E and Suresh, S (2015) Relative contributions of project quality to customer satisfaction in Nigerian road construction projects *In:* Raidén, A B and Aboagye-Nimo, E (Eds) *Procs 31st Annual ARCOM Conference,* 7-9 September 2015, Lincoln, UK, Association of Researchers in Construction Management, Pp. 763-772.

7.6 Chapter summary

The interviews were intended to obtain in-depth information from construction practitioners on the effect of the input themes on the output themes. Adopting the activity box syntax was a good choice as the cause and effect reasoning depicted by the framework aided the ease of the qualitative study. The respondents affirmed that the themes which included a legal framework for road construction projects, a thorough cost breakdown encompassing project funding modalities, a risk analysis identifying and providing mitigation measures for risks as well as implementation of health and safety considerations were vital for enhancing project quality and customer satisfaction within road construction projects in Rivers state, Nigeria. Also the encouraged use of professional experts for construction activities, adoption of advanced technology for construction practices, innovative approaches to construction management involving excitement factors were all geared at enhancing satisfaction from the constructed roads. Furthermore, the adoption of scheduled maintenance for road maintenance as well as post project evaluations ensured continuity of quality and satisfaction of the constructed roads. The findings also advocated the exemption of failed contractors from further government road construction, albeit visible improvements are made. It is thus inferred from the findings herein that there exists a strong significant relationship between project quality and customer satisfaction and this is supported by literature.

Convergence of the research findings to existing literature and the academic validation through research publications further validated the findings from this research. Although not all the attributes of project quality and customer satisfaction captured in the research are significant, or show positive interrelationships, the findings suggest that there is strong evidence that project quality has a significant impact on customer satisfaction, can be used to predict customer satisfaction and can explain the variance in customer satisfaction within road construction projects in Rivers State, Nigeria. This however provides answers for research question 4 (Section 5.7) and completes the research analysis and validation section of this research. The conclusions, limitations and recommendations for further study are thus presented in chapter 8.

8. CHAPTER 8 CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the concluding remarks of the research reported in this thesis. It commences with the summary of the thesis and draws conclusions based on the findings from both the literature review and the empirical research carried out in this thesis. The limitations as well as recommendations for future research were also highlighted in this chapter.

8.1 Summary of the thesis

This thesis entailed the development of a framework for enhancing project quality and customer satisfaction within government road construction projects in Nigeria. The study tested the interrelationships between the attributes of project quality which were performance, reliability and aesthetics, and the attributes of customer satisfaction measured through contractor re-patronage and referral. Strong, positive and significant relationships were found between the aforementioned variables and the research made efforts to determine both the individual and joint contributions of the variables of project quality to customer satisfaction. Emphasis was made on highlighting strategic areas within road construction where improvements could be made to enhance the quality of the final project while meeting or exceeding the expectations of the users also referred to as the customers. Satisfied customers are seen as a vice for effective project delivery and satisfaction was established as one of the requirements for quality. The thesis however presented a framework consisting of activities within construction management that possessed the potential of meeting or exceeding customer expectations while carrying out road construction projects.

The research problem and the rationale for undergoing a research of this nature were established in chapter 1 of this thesis. The research aim and objectives and the accompanied questions the research sought answers to were stated in the first chapter. The chapter concluded with an organizational breakdown which guided the research journey. Chapters 2 and 3 entailed a review of relevant literature on construction projects, project quality and customer satisfaction in construction. The choice and definitions of the research variables were stated in these review chapters, and a conceptual framework was developed. This framework highlighted on the interrelationships that needed to be discussed, analyzed and interpreted through analysis. In chapter 4, the adopted research design and its justification was presented through the research methodology. Chapter 5 contained the presentation of

data collected from construction practitioners within the Nigerian construction industry as well as the results from subjecting the data to stepwise multiple regression analysis. Inferences drawn on the findings from the quantitative data informed the development of the Government Road Construction Satisfaction Framework GORCOS detailed in Chapter 6. Chapter 7 entailed the framework validation and offered a justification of the research design as well as the quality of the research findings, while chapter 8 presented the conclusion of the thesis. Figure 8.1 presents a schematic representation of the thesis summary.

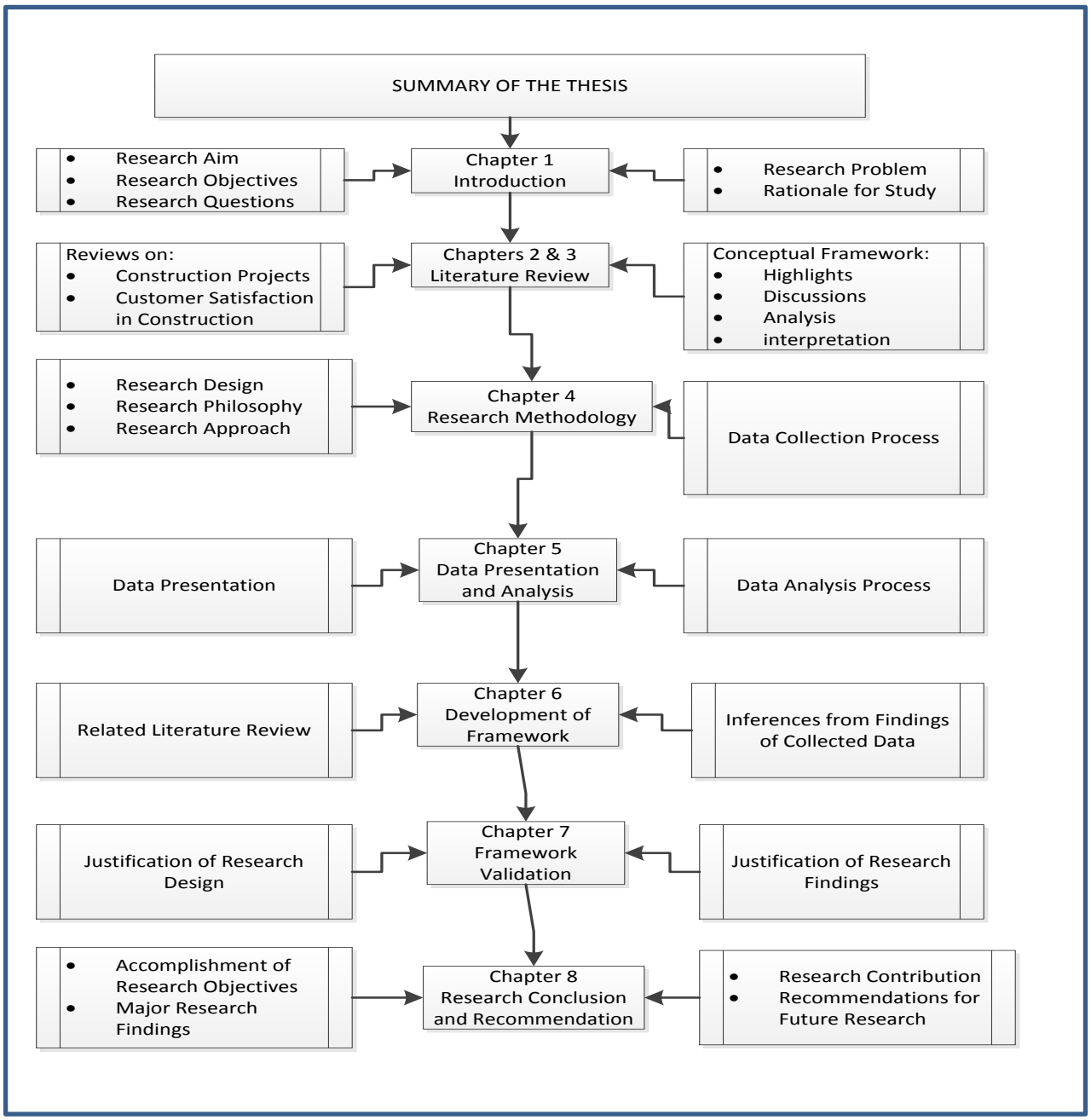


Figure 8.1: Summary of thesis

The proposed framework could be adopted by public and private road construction establishments, government officials associated with road construction and for academic issues relating to customer satisfaction in construction.

8.2 Accomplishing the research aim and objectives

The objectives for this research were clearly stated in chapter 1 of this research. In the course of the research, these objectives have be successfully accomplished, further providing answers for the research questions. A synopsis on how the objectives were accomplished is therefore presented.

Objective 1: To investigate the understanding of construction practitioners on the relationship between project quality and customer satisfaction within Government road construction projects. This was initially achieved through a review of literature on quality and satisfaction in construction. The findings suggested relationships actually existed but the extent of such relationships were unknown. Furthermore, analysis of the demographics of respondents and a summary of the findings from the decision table based on mean and standard deviations indicate that the surveyed respondents had a wide understanding of the constituents of project quality and satisfaction in construction and hence were a logically valid sample. This objective was geared at ensuring that the right people were surveyed for this research and ascertaining that the findings from literature were also in existence in the Nigerian construction industry.

Objective 2: To develop a conceptual framework to determine the extent of relationship between the attributes of project quality which include performance, reliability and aesthetics, and the attributes of customer satisfaction which include contractor referral and re-patronage. This was arrived at sequel to the extensive literature review. The framework was presented in Figure 3.13 and showed what relationships needed to be investigated in the course of the research. The framework consisted of variables summarized from literature to explain the contributions and effect of the project quality on customer satisfaction. The conceptual framework which entailed relationships between two or more variables further informed the method of analysis employed, stepwise multiple regression analysis.

Objective 3: To collect quantitative data through field work on the interactions between the attributes of project quality and customer satisfaction within Nigerian road construction projects. Empirical data for this research was obtained quantitatively from a sample of 503 respondents. The respondents consisted of Architects, Surveyors, Project managers,

Engineers and Construction administration personnel, categorized as *"others"* in the research having a minimum range of working experience between 1- 10 years. Analyzing the demographic distribution of the respondents, 16% have been involved with about 11-20 road construction projects within their career, and 85% of the respondents have been involved with road construction by asphalting especially with state trunk 'B' roads. The experience and expertise of the respondents were employed to generate data for the research and their opinions on the questions asked were represented through the rankings on the questionnaire.

Objective 4: To analyze data obtained and evaluate the percentage contributions and effect of each attribute of project quality on the corresponding attribute of customer satisfaction. Stepwise multiple regression analysis was employed to arrive at the percentage contributions of the attributes of the independent variable on the dependent variable. Also, the analysis of variance ANOVA was employed to determine if there were significant differences between the means of the variables in the research.

Both individual and joint contributions were evaluated with performance identified as the highest contributor to the variance in contractor re-patronage, 43.1% while aesthetics was found to be the highest contributor to contractor referral, 57.1% within Government road construction projects in Rivers State, Nigeria. Jointly however, reliability which was found to be the lowest predictor of contractor referral and re-patronage when analyzed individually was responsible for 32 and 21.1% of the variance in re-patronage and referral, i.e. customer satisfaction.

Objective 5: To develop the Government Road Construction Satisfaction Framework GORCOS. This was achieved by drawing inferences from the quantitative study. The results informed the researcher on the attributes with higher potential for satisfaction and these were categorized into input, contextual and output themes for the framework development. The framework highlights on areas that construction practitioners would need to re-visit in order to enhance the quality of the constructed road, ensure accountability of materials and resources and consequently satisfy the customers or road users. The developed framework however entailed issues already known from literature as well as particular issues relating to the Nigerian construction industry. Findings such as improved project monitoring enhanced project maintenance and the presence of excitement factors were viewed by construction practitioners as particular to the Nigerian construction industry.

Objective 6: To obtain in-depth knowledge through qualitative interviews on the prevalence, implementation and/or alternative approaches. Triangulation was employed in the research, complementing the findings from the quantitative survey with structured interviews. 10 interviews were carried out employing the knowledge of construction professionals. The findings affirmed the provisions of the framework, adding that there needed to be a feedback mechanism to redirect outputs back into the input themes. The findings further suggested the use of advanced technology in communication, surveillance and even the development of a mobile application to enhance monitoring and communication between concerned parties involved with road construction projects.

Objective 7: To validate and update the GORCOS. This was accomplished through triangulation, combining the findings of both the quantitative and qualitative studies. In addition, the convergence of research findings with academic literature and the academic validation were employed to validate the GORCOS and the findings were presented. The input themes provided by the framework were intended to aid the construction project life cycle and were geared towards ensuring that satisfaction could be obtained from construction management. The validation however made efforts to justify the framework in particular and the thesis in general through the number of cited academic materials. Articles from high impact journals such as Construction Management and Economics, International Journal of Project Management, Engineering Construction and Architectural Management etc. were consulted, reinstating the robustness of the validation and research.

Objective 8: To draw conclusions based on the findings from the research. This has been achieved through the iterations on the attributes of performance, reliability and aesthetics responsible for the percentage contributions to customer satisfaction. In other words, the conclusions buttress the implementation of the input themes with the intention of obtaining the output themes through the contextual themes as obtained in the GORCOS.

8.3 Main findings:

Through the course of this research, there is indeed the possibility to enhance the quality of construction project delivery in Nigeria, as well as the quality of the constructed facility and consequently the satisfaction obtained from construction. The findings further suggest activities that could lead to better road construction delivery, especially by re-patronizing or referring contractors, while placing accountability and law enforcement measures in place. The GORCOS is seen as a *"step- in- the- right- direction"* if the desire is to improve

construction project delivery in Nigeria while ensuring that the customers to the constructed project remain satisfied. Other findings obtained from this research include

a) The literature review aided in the identification of 25 quality management attributes as well as the barriers to quality management implementation. Based on relevance to road construction, three of the attributes defined as project quality attributes were considered for analysis and the sought after relationships were provided by the conceptual framework. This finding has however been published at a peer reviewed conference.

b) Strong, positive and significant relationships existed between the attributes of project quality which are performance, reliability and aesthetics, and the attributes of customer satisfaction, contractor re-patronage and referral. Although, reliability was found to be the least contributor to customer satisfaction, an increase in any of the dependent variables will yield a significant increase in the total output of the dependent variable, customer satisfaction. These were expressed by the regression equations in chapter 5.

c) From the literature review, it was inferred that an opportunity existed in exploring construction management to enhance or complement the activities of other construction participants such as Architects, Engineers, etc. It was also discovered that in Nigeria, the addition of construction to the country's' GDP was on the decrease and the research sought critical pathways to improve on construction activities in a manner that would yield satisfaction.

d) The methodology and research design adopted showed that perception or opinion can be measured and rated; through the questionnaire design using Likert scales. The ordinal data generated could then be subjected to parametric tests such as the stepwise regression analysis, and not limited to non-parametric tests. Furthermore, the joint and individual contributions of project quality to customer satisfaction, indicates how relevant the relationship between the variables are and suggests areas that need more attention. This finding has also been made a peer reviewed publication.

8.4 Research contribution and Novelty

Whereas most research on satisfaction in construction have dwelt on issues pertaining to quality, cost and delivery time, health and safety, this research goes an extra mile to consider the project performance, factors influencing its reliability and the nature of aesthetics employed, all geared at enhancing customer satisfaction in Government road construction

projects. A research of this nature has seldom been carried out and hence entails the novelty of the research. The GORCOS is therefore presented as a novel research contribution to knowledge as both the quantitative and qualitative research methods employed affirm the relevance of the framework. The adopted methodology had been employed in research in construction management such as Tang, Lu and Chan (2003) and Chan *et al.,* (2010) and this research built upon the findings from such research. This research identified the need for innovative approaches to construction in terms of design, equipment and machinery, technology and aesthetics. The research also highlighted areas where construction practitioners and government officials needed to channel more resources in order to ensure more satisfaction from the constructed road project. The framework further highlighted the need for a review of construction legislation and enforcement mechanisms that aid customer satisfaction within road construction projects. The research noted that there existed substantive laws that regulate construction practice in Nigeria, but the laws were either obsolete or lacked implementation means. Project monitoring was also encouraged to enhance accountability and ensure that the contractors deliver what was planned and agreed by the concerned stakeholders. In conclusion, a feedback mechanism was suggested for the framework to ensure that a closed loop interaction existed between the customers at the output end, and the input themes as presented in the framework. This would serve as a knowledge sharing and transfer medium to aid construction contractors learn from past projects, and input better construction practices into future projects. Adoption and/ or implementation of the framework is thus iterated as a step in the right direction for Government officials involved with road construction, and as a reference for other types of construction, or private construction practitioners who desire to obtain improved construction quality and satisfied users/customers. Other contributions of this research to knowledge are stated in chapter 1 of this research and the findings have been published in referred journal and academic conferences.

8.5 Recommendations for future research

Although the findings from this research go a large extent to resolving the research problem, there are still opportunities for further studies on enhancing construction project quality and customer satisfaction. Key areas include Whole Life Construction WLC which involves sustainability of the construction project life cycle, and cross cultural studies involving other

sectors of construction. While an adoption of the GORCOS is recommended for road construction projects in Nigeria, the following suggestions for future study are encouraged.

a) Linking stepwise multiple regression analysis to other analytical techniques such as Structural Equation Modeling SEM to enhance the robustness of the research and improve on the limitations of one technique. SEM may be used to model the interactions between the dependent and independent variables from a modeling perspective.
b) A research into the adoption and implementation of exciting attributes especially through the use of advanced technology to improve on the output themes presented in the framework. For instance, a mobile application to inform, observe and report construction activities (positive or negative) for prompt action by relevant authorities.
c) A cross-cultural testing of the GORCOS in other geographical locations to identify the role of culture in quality management and customer orientation. Roads are a common feature of any geographical location and hence empirical data relating to a chosen geographical location can be obtained, analyzed and inferences drawn.

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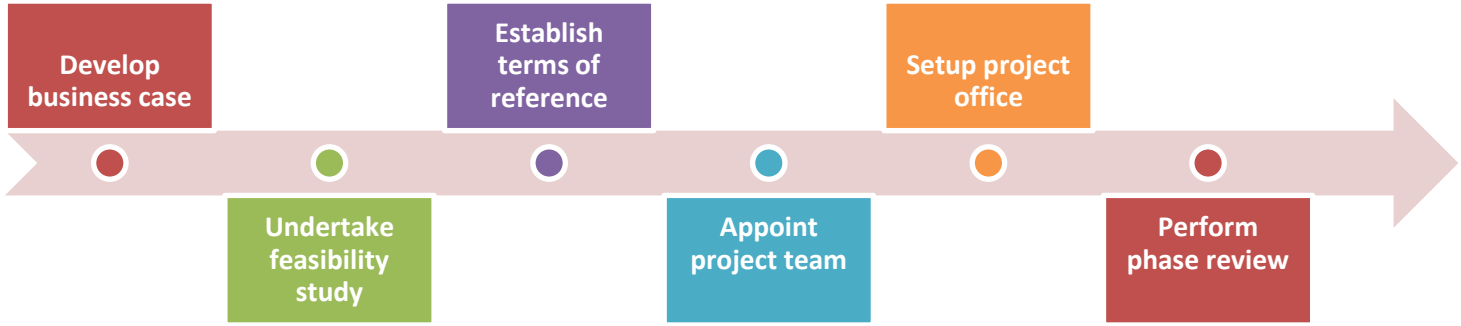
10. APPENDICES

10.1 APPENDIX 1A: PROJECT INITIATION PHARSE

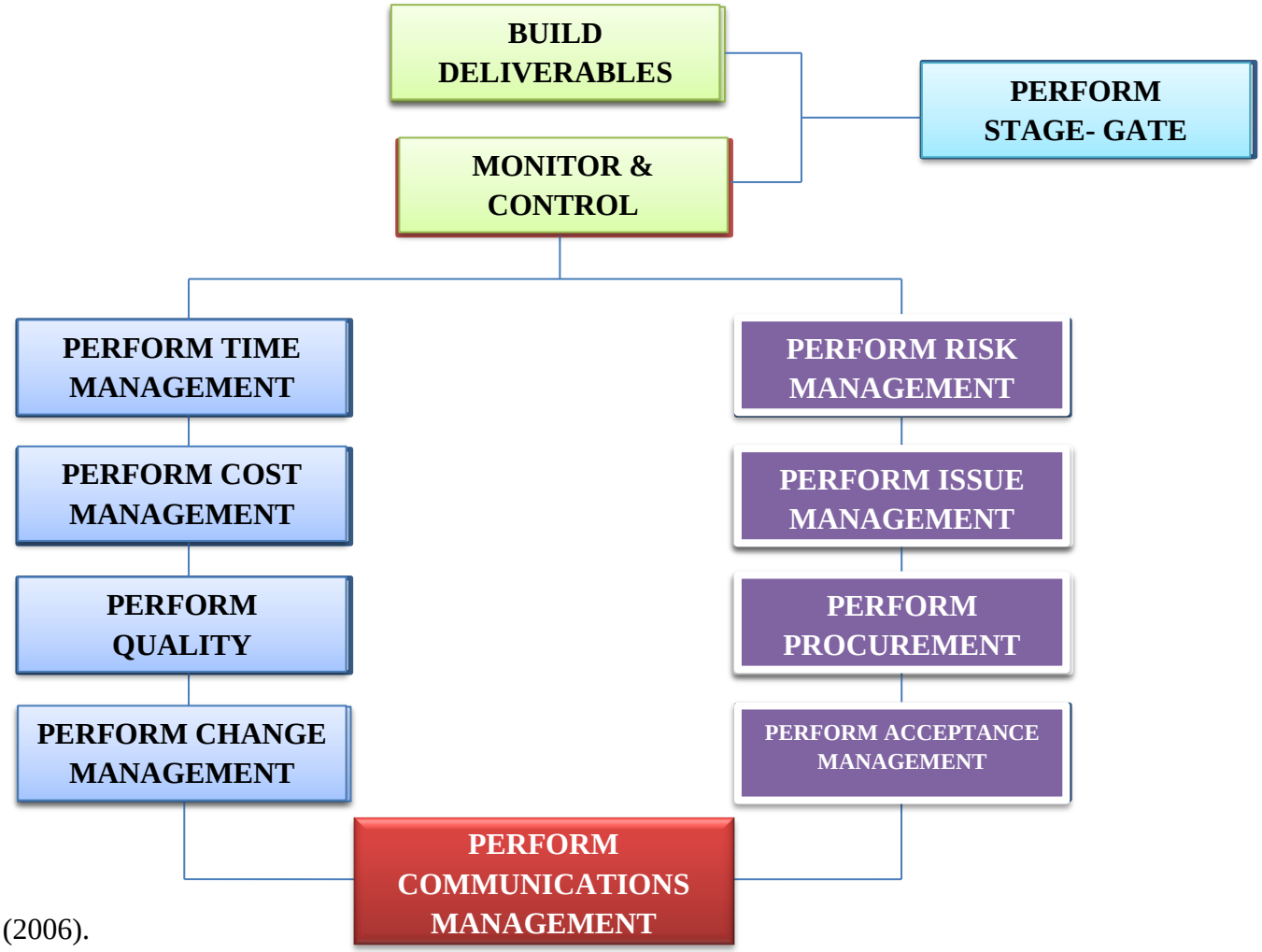


Adopted from Westland (2006).

10.2 APPENDIX 1B: PROJECT PLANNING PHASE

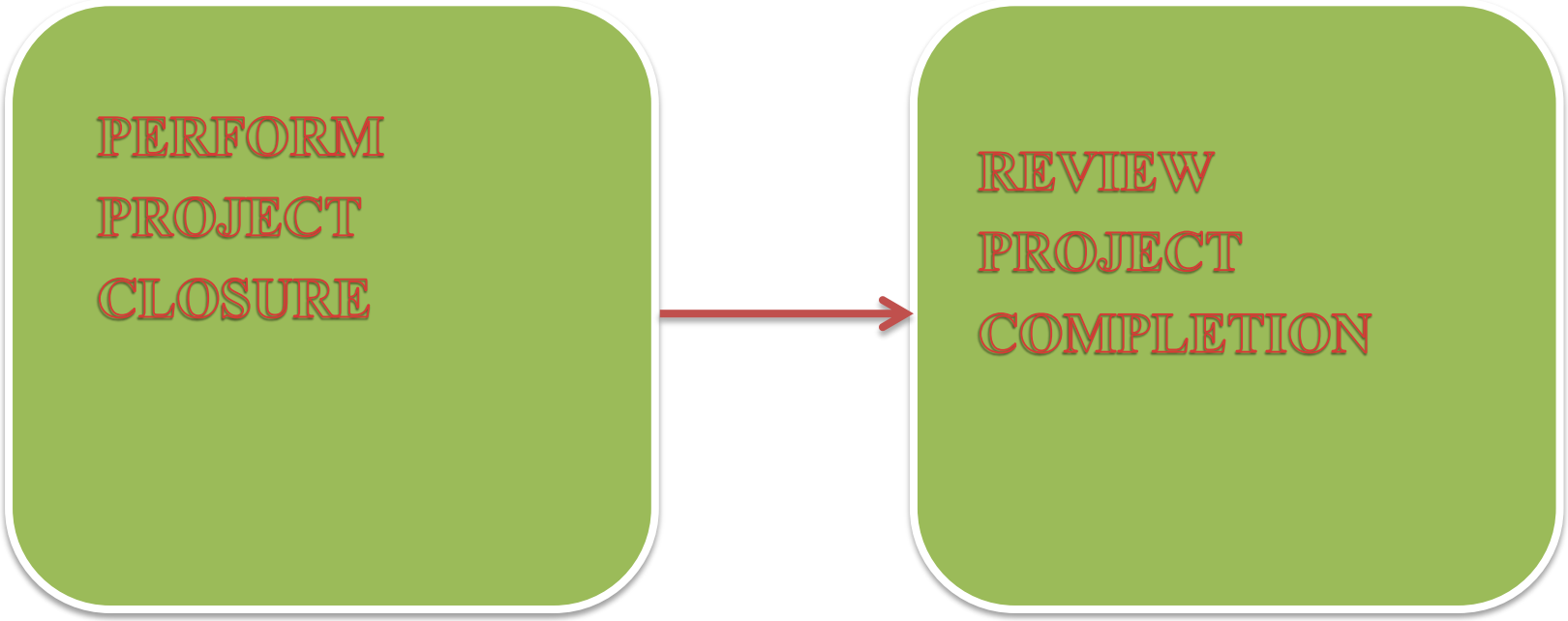
Adopted from Westland (2006).

10.3 APPENDIX 2: PROJECT EXECUTION PHASE



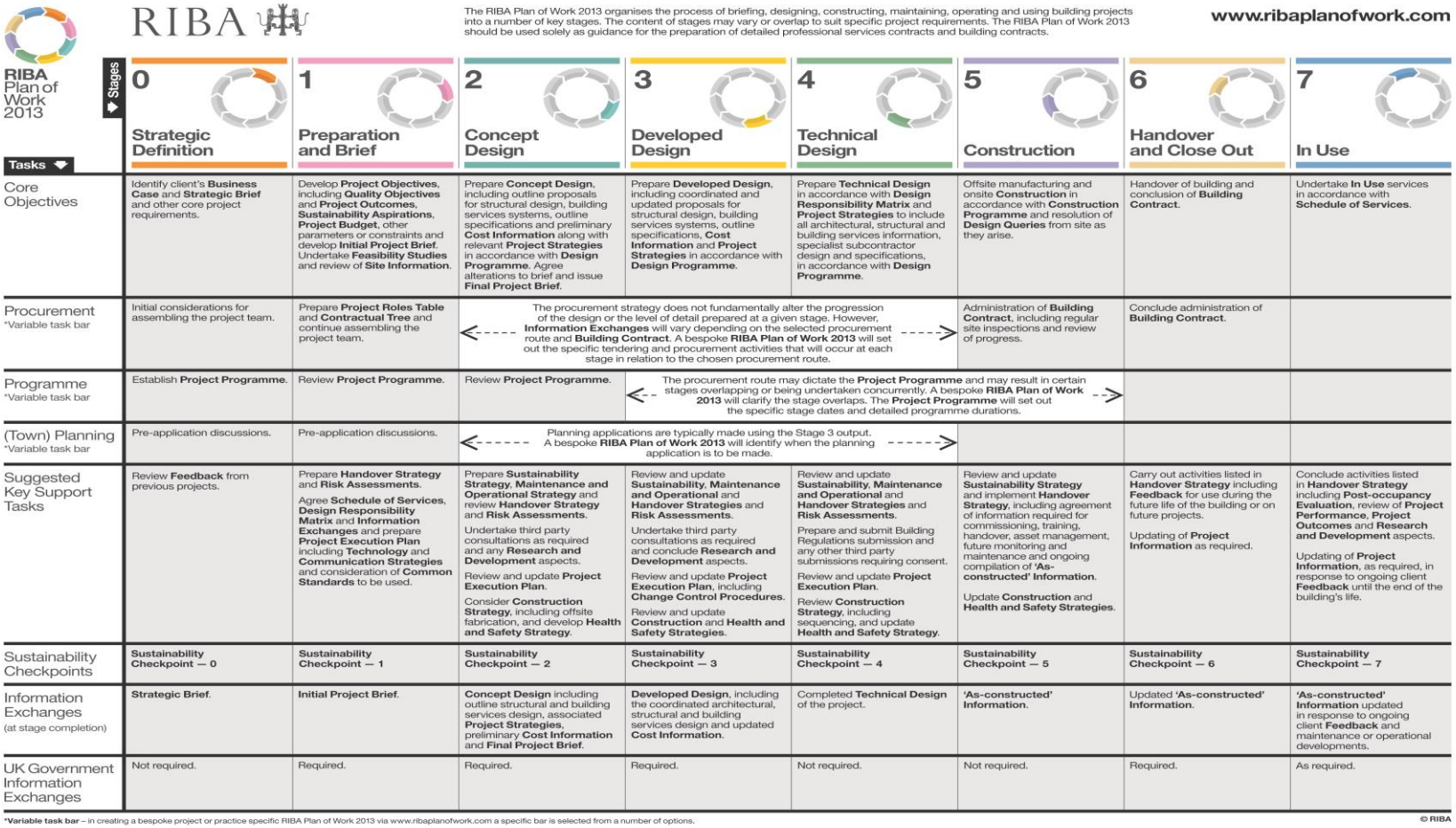
Adopted from Westland (2006).

10.4 APPENDIX 3: PROJECT CLOSURE PHASE



Adopted from Westland (2006).

10.5 APPENDIX 4: THE RIBA PLAN OF WORK



RIBA

The RIBA Plan of Work 2013 organises the process of briefing, designing, constructing, maintaining, operating and using building projects into a number of key stages. The content of stages may vary or overlap to suit specific project requirements. The RIBA Plan of Work 2013 should be used solely as guidance for the preparation of detailed professional services contracts and building contracts.

www.ribaplanofwork.com

RIBA Plan of Work 2013

Tasks / Stages	0 Strategic Definition	1 Preparation and Brief	2 Concept Design	3 Developed Design	4 Technical Design	5 Construction	6 Handover and Close Out	7 In Use
Core Objectives	Identify client's **Business Case** and **Strategic Brief** and other core project requirements.	Develop **Project Objectives**, including **Quality Objectives** and **Project Outcomes**, **Sustainability Aspirations**, **Project Budget**, other parameters or constraints and develop **Initial Project Brief**. Undertake **Feasibility Studies** and review of **Site Information**.	Prepare **Concept Design**, including outline proposals for structural design, building services systems, outline specifications and preliminary **Cost Information** along with relevant **Project Strategies** in accordance with **Design Programme**. Agree alterations to brief and issue **Final Project Brief**.	Prepare **Developed Design**, including coordinated and updated proposals for structural design, building services systems, outline specifications, **Cost Information** and **Project Strategies** in accordance with **Design Programme**.	Prepare **Technical Design** in accordance with **Design Responsibility Matrix** and **Project Strategies** to include all architectural, structural and building services information, specialist subcontractor design and specifications, in accordance with **Design Programme**.	Offsite manufacturing and onsite **Construction** in accordance with **Construction Programme** and resolution of **Design Queries** from site as they arise.	Handover of building and conclusion of **Building Contract**.	Undertake **In Use** services in accordance with **Schedule of Services**.
Procurement *Variable task bar	Initial considerations for assembling the project team.	Prepare **Project Roles Table** and **Contractual Tree** and continue assembling the project team.	The procurement strategy does not fundamentally alter the progression of the design or the level of detail prepared at a given stage. However, **Information Exchanges** will vary depending on the selected procurement route and **Building Contract**. A bespoke **RIBA Plan of Work 2013** will set out the specific tendering and procurement activities that will occur at each stage in relation to the chosen procurement route.			Administration of **Building Contract**, including regular site inspections and review of progress.	Conclude administration of **Building Contract**.	
Programme *Variable task bar	Establish **Project Programme**.	Review **Project Programme**.	Review **Project Programme**.	The procurement route may dictate the **Project Programme** and may result in certain stages overlapping or being undertaken concurrently. A bespoke **RIBA Plan of Work 2013** will clarify the stage overlaps. The **Project Programme** will set out the specific stage dates and detailed programme durations.				
(Town) Planning *Variable task bar	Pre-application discussions.	Pre-application discussions.	Planning applications are typically made using the Stage 3 output. A bespoke **RIBA Plan of Work 2013** will identify when the planning application is to be made.					
Suggested Key Support Tasks	Review **Feedback** from previous projects.	Prepare **Handover Strategy** and **Risk Assessments**. Agree **Schedule of Services**, **Design Responsibility Matrix** and **Information Exchanges** and prepare **Project Execution Plan** including **Technology** and **Communication Strategies** and consideration of **Common Standards** to be used.	Prepare **Sustainability Strategy**, **Maintenance and Operational Strategy** and review **Handover Strategy** and **Risk Assessments**. Undertake third party consultations as required and any **Research and Development** aspects. Review and update **Project Execution Plan**. Consider **Construction Strategy**, including offsite fabrication, and develop **Health and Safety Strategy**.	Review and update **Sustainability**, **Maintenance and Operational** and **Handover Strategies** and **Risk Assessments**. Undertake third party consultations as required and conclude **Research and Development** aspects. Review and update **Project Execution Plan**, including **Change Control Procedures**. Review and update **Construction** and **Health and Safety Strategies**.	Review and update **Sustainability**, **Maintenance and Operational** and **Handover Strategies** and **Risk Assessments**. Prepare and submit Building Regulations submission and any other third party submissions requiring consent. Review and update **Project Execution Plan**. Review **Construction Strategy**, including sequencing, and update **Health and Safety Strategy**.	Review and update **Sustainability Strategy** and implement **Handover Strategy**, including agreement of information required for commissioning, training, handover, asset management, future monitoring and maintenance and ongoing compilation of **'As-constructed' Information**. Update **Construction** and **Health and Safety Strategies**.	Carry out activities listed in **Handover Strategy** including **Feedback** for use during the future life of the building or on future projects. Updating of **Project Information** as required.	Conclude activities listed in **Handover Strategy** including **Post-occupancy Evaluation**, review of **Project Performance**, **Project Outcomes** and **Research and Development** aspects. Updating of **Project Information**, as required, in response to ongoing client **Feedback** until the end of the building's life.
Sustainability Checkpoints	**Sustainability Checkpoint — 0**	**Sustainability Checkpoint — 1**	**Sustainability Checkpoint — 2**	**Sustainability Checkpoint — 3**	**Sustainability Checkpoint — 4**	**Sustainability Checkpoint — 5**	**Sustainability Checkpoint — 6**	**Sustainability Checkpoint — 7**
Information Exchanges (at stage completion)	**Strategic Brief**.	**Initial Project Brief**.	**Concept Design** including outline structural and building services design, associated **Project Strategies**, preliminary **Cost Information** and **Final Project Brief**.	**Developed Design**, including the coordinated architectural, structural and building services design and updated **Cost Information**.	Completed **Technical Design** of the project.	**'As-constructed' Information**.	Updated **'As-constructed' Information**.	**'As-constructed' Information** updated in response to ongoing client **Feedback** and maintenance or operational developments.
UK Government Information Exchanges	Not required.	Required.	Required.	Required.	Not required.	Not required.	Required.	As required.

Variable task bar – in creating a bespoke project or practice specific RIBA Plan of Work 2013 via www.ribaplanofwork.com a specific bar is selected from a number of options.

Adopted from RIBA (2013).

10.6 APPENDIX 5: THE NIGERIAN CONSTRUCTION PROJECT LIFE CYCLE

Phases	Key activity	Life cycle comparison
Conceptualisation • Goal development • Technical specifications	• Feasibility study to determine viability of project.	Project Initiation
Planning • Detailed specification development	• Development of work packages, breaking down tasks into achievable actions. • Establishment of stakeholder communication method. • Development of project designs	Project planning
Execution • Actual physical work	• Actual implementation of designs and plans. • Effective monitoring and control for conformity to specifications and project objectives.	Project execution
Termination • Project handover.	• Relieving contractors, supplier, and resources from duty. • Communication to stakeholders on completion • Review through lessons learnt for future projects.	Project closure

Adopted from (Oke and Ogunsemi 2011; Olateju, *et al.*, 2011; Igbokwe-Ibeto 2012; Farinde and Sillars 2012)

10.7 APPENDIX 6: CONCEPTUAL FRAMEWORK LINKING QUALITY AND CUSTOMER SATISFACTION ATTRIBUTES TO THE NIGERIAN PROJECT LIFE CYCLE

ADOPTED NIGERIAN PROJECT LIFE CYCLE	Conceptualisation	Project planning	Tender documentation and Tendering	Construction/execution	Termination / Handover	Post-handover review
CUSTOMER SATISFACTION ATTRIBUTES	√	√				
Prior expectations	√	√		√		
Customer perceptions	√	√				
Short term benefits						
Medium term benefits		√	√	√		
Long term benefits	√	√	√	√		√
Reviewed quality					√	√
Value expectation		√	√			
Actual performance						
Presence of excitement factors	√	√		√		
Exceeding optimal satisfaction level (OSL)				√		
Actual quality		√	√	√		
Overall performance				√		√
Attracting new customers						
Handling customer complaints					√	√
QUALITY ATTRIBUTES						
Quality planning	√	√				
Use of quality tools (TQM, LEAN, EFQM, JIT)		√				
Quality control						
Waste elimination				√		
Quality standard implementation		√	√	√		
Legal and aesthetic requirements			√	√	√	
Client satisfaction						√
Overall customer satisfaction		√		√	√	√

10.8 APPENDIX 7: CRITIQUE ON PCM ACTIVITIES AND NIGERIAN PROJECT LIFE CYCLE

CRITIQUE ON PCM ACTIVITIES AND NIGERIAN PROJECT LIFE CYCLE			
PCM MODEL	NIGERIAN PLC	ADOPTED NIGERIAN PLC	COMMENTS
---	Conceptualisation	Conceptualisation	Similar activities involving the general project outline, feasibility studies for project viability, and project team formation. It is assumed that at this phase in PCM, the project is already known, hence its absence and direct entrance to project planning.
Planning	Planning	Project planning	Similar activities which involve designer selection, standards review implementation, and breaking of tasks into achievable work packages. Planning ensures proper project and task understanding and is critical requirement in both PCM and the Nigerian PLC.
Design	---	---	This is the distinguishing factor between PCM and the Nigerian PLC. While the design phase is embedded in the planning phase of the Nigerian PLC, PCM has an entire phase dedicated to design. However, this is possible in PCM as it involves professionals in specific project areas rather than the Nigerian PLC which is a generic model for construction projects.
Bid and Tender	---	Tender documentation/ Tendering	Review of contractor qualifications and project tenders. Bid and tender acceptance. This has been attached to the adopted Nigerian PLC to enhance the contractor selection procedure and ensure quality improvements based on the selection. However, this was initially a part of the project planning process.
Construction	Execution	Execution	Similar activities in PCM and the Nigerian PLC. In the Nigerian PLC, this involves physical construction of the project, implementing the plans. However in PCM, construction extends to site safety and hygiene, traffic management during construction as well as handling change orders and contract disputes.
Inspection and acceptance	Termination	Termination/ Handover	Similar activity in both PCM and the Nigerian PLC involving final checks, commissioning and handover of project to owner. Project closure and maintenance plan agreed upon. This is very important to ensure that the project deliverables have been achieved and satisfaction from construction obtained.
	---	Post-handover review	This has been adopted into the Nigerian PLC due to the nature of existing projects, requiring expensive maintenance post-handover. For PCM services, the life cycle ends with project completion and the project team dissolved. However, if Post-handover reviews are added to Nigerian PLC's, preventive maintenance can be enforced, ensuring longer lasting construction projects.

10.9 Appendix 8 Questionnaire

School of Architecture and Built Environment
Faculty of Science and Engineering,
University of Wolverhampton,
Wulfruna Street
Wolverhampton WV1 1LY,
United Kingdom.
7th July 2014.

Dear …….

A PhD RESEARCH QUESTIONNAIRE: PROJECT QUALITY AND CUSTOMER SATISFACTION REGARDING GOVERNMENT ROAD CONSTRUCTION PROJECTS IN RIVERS STATE NIGERIA.

My name is Chimene Obunwo, and I am a PhD student of the University of Wolverhampton. As a part of my programme, I am carrying out a study into Project quality and customer satisfaction regarding Government road construction projects in Rivers State, Nigeria. The study focusses on rural and urban internal roads under the state (trunk B) and local government (Trunk C) classification. I would like to invite you to participate in this research by completing a questionnaire for me.

Completion of the attached questionnaire will take approximately 30 minutes, and all questions can be answered by following the simple instructions. Completion of the questionnaire is completely voluntary. All responses are anonymous; there are no correct or incorrect answers and respondents who take part will not be identifiable. If results of this study are published these will be a summary of all responses to ensure that your privacy is protected.

Please return your completed questionnaire directly to the researcher using the address indicated above. However no identifiable markings should be used to ensure anonymity. Returning this questionnaire will be considered as your consent to participate in the survey.

Please note that all data gathered for this research will be stored securely and destroyed after the thesis has been submitted. My supervisors and I will be the only people who will have access to this data. Once completed a summary of the research results will be available at the conclusion of the PhD study. If you wish to obtain a copy of these results, please indicate so and provide your contact details.

Thank you for taking time to consider this invitation and if you choose to participate in this research, I would like to extend my personal gratitude; your contribution is greatly appreciated.

Yours sincerely,

…….

Chimene Obunwo

Ph.D. research student.

QUESTIONNAIRE: PROJECT QUALITY AND CUSTOMER SATISFACTION REGARDING GOVERNMENT ROAD CONSTRUCTION PROJECTS IN RIVERS STATE NIGERIA.

Instructions

Please answer all questions. There are three sections, A, B and C. Section A requests general information about you and the specific road construction project; Section B requests information about project quality and Section C requests information on customer satisfaction with government road construction projects.

SECTION A1: GENERAL DETAILS

1. Please indicate your years of experience in the field of construction

0-5 ☐ 6-10 ☐ 10-20 ☐ >20 ☐

2. Please indicate your designation.

Architect ☐ Land Surveyor ☐ Quantity surveyor ☐

Engineer ☐ Project manager ☐

Other (Please Specify) ☐

3. You are completing this questionnaire as …..?

Government body ☐ Contractor ☐ Customer/ user ☐

Client (Private) ☐ Funding body ☐ Other (Please specify) ☐

If 'Other' or 'Customer/ User', please proceed to Section A2. Otherwise, continue to Question 4.

4. Please indicate the number of employees in your organisation

0-10 ☐ 11- 50 ☐ 51-100 ☐ 101- 500 ☐ >500 ☐

5. Please indicate the approximate annual turnover of your organisation (₦M= Million Naira).

< ₦ 5M ☐ ₦ 6M - ₦ 20M ☐ ₦ 21M - ₦ 50M ☐ > ₦ 50M ☐

6. Please indicate the number of projects ever handled by your organisation including current projects.

<10 ☐ 11-20 ☐ 21- 50 ☐ 51 -100 ☐ 100-250 ☐ 251-500 ☐ >500 ☐

SECTION A2: CHARACTERISTICS OF ROAD PROJECT IN CONSIDERATION.

7. Kindly indicate the type of road responding on

Road classification: Federal trunk A roads ☐ Federal trunk F roads ☐

State trunk B roads ☐ Local government trunk C roads ☐

Project type: New road ☐ Rehabilitation ☐ Maintenance ☐

Road length: <1km ☐ 2-5km ☐ 6- 10km ☐ >10km ☐

Project finishing: Asphalt ☐ Concrete ☐ Stone-base ☐ Others ☐

SECTION B:

This section concerns project quality regarding Government road construction projects in Rivers State. It evaluates opinions on quality in terms of Project Performance, Reliability and Aesthetics. Please tick **X** to indicate your opinions on the basis of:

1- is strongly disagree
2- is disagree
3- is indifferent
4- is agree
5- is strongly agree

S/No	B1 - PROJECT PERFOMANCE						
	Performance refers to the financial and schedule related attributes of a construction project ***In your opinion, project quality in Government Road Construction Projects is optimised when***	**Your opinion**					
		1	**2**	**3**	**4**	**5**
1	Projects are executed within an agreed budget					
2	Construction site personnel work individually					
3	Construction site personnel work in teams					
4	Contractors prefer quality to cost					
5	The government body which awards a contract prefers quality to cost					
6	Customers (road users) prefer quality to cost					
7	The client (government) determines the project design					
8	The road construction projects adequately meet the commuting needs of the customers					
9	Projects are designed around the needs of the customer					
10	The finished project seemingly meets the design specifications					
11	Complaints from intended end users about quality are handled promptly by the relevant authorities					
12	Differences about quality between the government (client) and the contractors are resolved promptly.					
13	Differences about quality between the government (client) and the contractors are adequately resolved.					
14	Road projects are supervised by qualified government staff					
15	Skill development trainings for Government staff handling road projects are provided					
16	Government officials delegate supervisory responsibilities					
17	Contractors offer regular skill enhancement trainings to their employees					
18	Awareness on safe use of constructed road is provided by the Government					
19	Road projects are executed with delays due to the clients' inability to meet the contract financial terms					
20	Indigenous road construction companies are patronised by the government.					
21	Construction contracts are awarded to non-indigenous road construction companies by the government					
22	Benchmarking project plans of roads constructed by foreign experts					
23	Contractor re- patronage for excellence is guaranteed by the client.					
24	Road construction companies enjoy high level referral by their clients, the Government.					
25	Contractors handling road construction projects are motivated through referral by the Government.					
	Poor project performance can be attributed to						
26	Construction delays due to inefficient handling of materials					
27	Contractors' inability to meet their wage obligations to employees					
28	Client's inability to make scheduled payments to contractors.					

29	Project abandonment due to design failure					
30	Accelerated construction by the contractor due to unsafe working environment.					
31	Project abandonment due to low cash flow					
32	Incessant project abandonment and restarting					

1 -is strongly disagree **4- is agree**

2 - is disagree **5 - is strongly agree**

3 - is indifferent.

B2 - PROJECT RELIABILITY						
	Project reliability means the failure- free performance of a project when operated under stated conditions.	**Your opinion**				
S/No	**Questions;** ***In carrying out government road construction projects in Rivers State, what is your opinion on the following issues pertaining to project reliability as an aspect of project quality?***	**1**	**2**	**3**	**4**	**5**
33	Contractors conform to designed specification					
34	Project designs contain sufficient details					
35	Project construction entails the adoption of international best practices (benchmarking) by the contractors.					
36	Road projects should be procured on a 'build and maintain' basis.					
	Professional expertise should be utilised in :					
37	Project design					
38	Project management					
39	Project auditing					
40	Financial management					
41	Quality control					
42	Construction equipment operation					
	In carrying out road construction, what is your opinion on the following issues pertaining to project reliability?					
43	Contractors exhibit improvements from past projects					
44	Clients (Government body) monitor contractors closely to deliver project.					
45	Defects are addressed before project handover					
46	Completed road undergoes frequent maintenance by contractors that constructed the road where applicable.					
47	An independent contractor is needed for project maintenance					
48	Spontaneous inspection should be carried out by top Government officials					
49	Community leaders should be involved with road inspections					
50	The Government body should enforce strict penalties for health and safety regulations violation.					
51	Health and safety considerations by contractors are top priority from planning to execution					

52	The knowledge of reliability (non- failure within given time) from past projects influences referral					
53	The judgement of the project users through post project evaluations influences re- patronage by the client (government).					

1 - is strongly disagree

2 - is disagree

3 - is indifferent.

4 - is agree

5 - is strongly agree

B3 - PROJECT AESTHETICS							
	Aesthetics in this context refers to the visible, physical appearance of the constructed project.	**Your opinion**					
	Questions; ***Considering government road construction projects in Rivers State, what is your opinion on the following issues of project quality in relation to aesthetics?***	**1**	**2**	**3**	**4**	**5**
54	The Government body which awards the contract insist on using standard approved materials only					
55	Contractors adhere to the ISO standards they subscribe to in carrying out construction jobs					
56	A Condition of the contract award entails strict adherence to quality standard implementation					
57	Specifications conform to world class standards					
Modern technology is utilised in road construction, i. e;							
58	Information Technology					
59	Automation of construction equipment e.g. programmable concrete mixers.					
60	Knowledge management particularly the sharing of information from top management to bottom staff					
61	Traffic simulations					
62	Mechanisation instead of manual labour					
63	In the Surveillance of project against vandals					
What is your opinion on the following project quality issues pertaining to aesthetics within government road construction projects in Rivers State?							
64	Government road projects contain excitement factors otherwise called “Artistic Inventions”					
65	Project designs are uniquely adapted to the project environment					
66	Physical appearance of road is top priority to customers					
67	Physical appearance is a measure of quality of road					
68	Project beauty does not undermine its efficiency					
69	The contractor’s choice of material for project finishing poses no health hazards.					

70	The approved design choice of materials for project finishing complies with health and safety standards.					
71	Issues on the physical nature of the finished project are included in post project customer satisfaction surveys					
72	Nature of road aesthetics can determine contractor re- patronage					
73	Aesthetic quality of finished road influences contractor referral.					

Section C

The questions in this section are designed to identify and measure customer satisfaction with government road construction projects in Rivers State. The responses are;

1. **for highly unsatisfied**
2. **for unsatisfied**
3. **for indifferent**
4. **For satisfied**
5. **for highly satisfied**

Please tick **X** **against** the option that suits you.

C1 - RE- PATRONAGE							
	In the absence of compulsory bidding, Contractor re-patronage occurs when the client and customers are satisfied with the project delivery.	**Your opinion**				
S/No	**Questions;** ***In your opinion, how satisfied are you with the following issues that boost contractor RE-PATRONAGE regarding Government road construction projects?***	**1**	**2**	**3**	**4**	**5**
74	Road projects in Rivers State in comparison with other world class roads					
75	Adherence to health and safety requirements by contractors involved with road construction.					
76	Presence of Excitement (innovative) factors in the constructed roads.					
77	Ease of pedestrian movement					
78	Ease of vehicular movement during construction.					
79	Project planning.					
80	Provision of alternative routes during construction.					
81	Contractors' use of labour from host community					
82	Facilitated construction process through use of foreign expertise by the contractors					
83	Efficient construction waste management by contractors					
Considering government road projects in Rivers State, how satisfied are you with the finished road projects' properties in terms of						
84	Agreed cost					
85	Conformance to scheduled delivery time					
86	Customer assessment of satisfaction through post project evaluations					
87	Providing economic development to the host community					
88	Exceeding user expectation					
89	Contractor re- patronage					
90	Indigenous contractors project delivery					
91	Contractual agreement support for use of indigenous labour					

1 - is strongly disagree
2 - is disagree
3 - is indifferent.
4- is agree
5 - is strongly agree

C2 – REFERRAL							
	Referral is a process whereby a contractor is suggested to bid for another job based on outstanding project delivery.	**Your opinion**				
S/No	**Questions;** ***In your opinion, how satisfied are you with the following issues in Government road construction projects pertaining to referral.***	**1**	**2**	**3**	**4**	**5**
92	On time completion of road construction					
93	Physical judgement of the strength of materials used					
94	Alternative commuting measures in place while carrying out construction					
95	Use of automated (mechanised) equipment					
96	Benefits of road project over its cost					
How satisfied are you with the following properties of government constructed roads in river state?						
97	Durability of the road					
98	Project Reliability in terms of time before road maintenance is required					
99	Provision of drains					
100	Provision of pedestrian pathways					
101	Relationship between contractors and the host community					
102	Maintenance culture of constructed roads					
103	Contractor referral based on evidence of successful completed projects.					

Overall Comment on project quality regarding road construction projects in Rivers State

_____
_____
_____
_____
_____
_____

End of questionnaire.

Thank you for your time.

Please return your completed questionnaire to:
Name: Chimene Obunwo (Research Student) or Facilitator.

Address: School of Architecture and Built Environment, Faculty of Science and Engineering, University of Wolverhampton, U.K. WV1 1LY.

Please provide your Contact details if you require a copy of the results of this survey:
……
……

10.10 Appendix 9 Interview Guide

Covering letter for interviews

School of Architecture and Built Environment
Faculty of Science and Engineering,
University of Wolverhampton,
Wulfruna Street
Wolverhampton WV1 1LY,
United Kingdom.
7th June 2014.

Dear Sir/ Madam,

I am a PhD student at the University of Wolverhampton, United Kingdom. I am currently carrying out a research on Project quality and customer satisfaction in Government road construction projects in Rivers State, Nigeria.

The findings from this research would assist stakeholders and academicians in the construction sector identify satisfaction antecedents obtainable in Government construction projects. In addition, the research intends to establish the relationship between project quality and customer satisfaction and effective implementation strategies for quality management that optimise customer satisfaction.

I would be extremely grateful if you could participate in an interview pertaining to this research. This interview should last approximately 35 minutes. Participation is entirely voluntary, and completion of the declaration below is an indication of willingness. The information obtained is strictly confidential and for academic purposes only.

Yours Faithfully,

…….
Chimene Obunwo
PhD Research student.

Declaration:

I voluntarily wish to be interviewed. I understand that any information provided is strictly for academic purposes and will remain confidential.

Signature……..

Date of interview…….

Time of interview……....

Interviewee……..

Interview questions for framework validation

1. How conversant are you with the legislation on road construction project procurement in Nigeria. Are there enough laws and are they adequately implemented?

2. With your experience, the funding provisions/modes/methods for road construction are they adequate? Does the method of funding have any impact on customer satisfaction?

3. Road construction projects involve a lot of risks. Do you think contractors do enough to identify and consequently mitigate these construction risks?

4. The framework proposes the use of professional experts in design, financial and project management. How effective do you think this would be?

5. Technology has been used to improve on construction processes in developed economies. Is this also prevalent in the Nigerian construction industry and apart from the areas listed in the framework, what other areas would advanced technology be needed in road construction projects?

6. Are there enough innovative approaches in road construction projects in Nigeria? Do customers seem excited and satisfied with the innovative construction available?

7. Considering Government Construction Projects GCP's, is there an efficient project monitoring strategy in place? Would such strategy enhance the satisfaction obtained from the constructed roads?

8. The maintenance strategy adopted in the framework, does it have the potential for customer satisfaction? What other maintenance strategy could be incorporated to enhance customer satisfaction?

9. Do contractors/ firms improve on past performances through post-project evaluations? From your experience, is there a learning process within road construction projects?

10. The use and re-use of contractors based on positive past performance (also known as Referral and Re-patronage), what effect does it have on customer satisfaction. If it does, what aspects of satisfaction would such use affect?

10.11 Appendix 10 Ethics forms

UNIVERSITY OF WOLVERHAMPTON

SCHOOL OF TECHNOLOGY

ETHICAL CONSIDERATION FOR RESEARCH PROGRAMMES

Section 1: Your details			
First Name & Surname:	CHIMENE U.C. OBUNWO	**Student No:**	1132741
Project Title	Improving Quality And Customer Satisfaction In Government Infrastructure Construction Projects In Rivers State, Nigeria.		
Director of Studies:	Dr Ezekiel Chinyio		

Section 2: Your Project Topic	
2.1 What problem is this project addressing? (100 words or less) This project intends to address the problem of customer dissatisfaction in Nigerian construction projects, with a pivot from quality management in construction. The aim of this research was to develop a model that incorporates the attributes of customer satisfaction into the project life cycle of Government construction projects in Nigeria such as roads, housing units and hospitals, with a focus on the nature of quality management obtainable. The target area in this research is the quality of infrastructure constructed and how best practices can be implemented in the area to be studied.	
2.2 Will information or artefacts resulting from your project be available externally to the University?	Yes
2.2.1 **If you answered 'yes' to 2.2,** Will any such information place anyone at risk or possibly result in any action that might be detrimental to their wellbeing? (See guidelines)	No. The information obtained is strictly for academic purposes and poses no risk to the well- being of participants as stated in Section 1: Category A1 of the ethics approval guidelines. Electronic copy of dissertation to be kept in the learning centre and could be accessed by others but no confidential information, such as transcribed excerpts will be included.
2.2.2 In what format will the information or artefacts be made available?	Publications in academic journals, conference proceedings and databases such as Ethos and WIRE.

Please attach samples with this form if you intend to do interviews, surveys, or questionnaires.	
3.1 Does any part of your proposed project involve human participants?	Yes **If 'no' proceed to section 4**
3.2 Please explain any aspects of the project, which might be detrimental to the wellbeing of any human participants in your project.	
No aspect of this project is detrimental to the wellbeing of human participants. Interviews will be codified for data protection purposes, and anonymity of questionnaire respondents would be ensured through the use of unmarked envelopes or direct collection from respondents.	
3.3 Are there other ways you might meet your project aims without involving human participants? If not, why?	
No other ways. This is basically because my research involves individual perceptions to the attributes of satisfaction, and the level to which Government construction projects have not offered such satisfaction through the quality of its construction projects. This information can only be obtained from human participants, hence the selected approach using these participants. **3.4** How will you select your participants?	
Participants will be selected based on their relevance to the Government construction project under investigation. Contracting firms would be obtained from the database of the ministry of works. Multi stage cluster sampling of respondents would cater for the quantitative data gathering, while Judgemental/ purposeful sampling would be employed while obtaining qualitative data. This would include developing a framework of variables to influence participation in addition to the demographic stratification of age, gender and social class.	
3.5 How many participants will you contact? About 1500 participants (Interviews 300 and questionnaires 1200).	
3.6 How will you approach potential participants? E.g. email, letter, face to face? Please append text of any letter or email? Participants for the interviews	

The database of contracting firms to Government projects would be obtainable from the Rivers State of Nigeria ministry of works, and relevant firms would be contacted through mail, e-mail and face to face depending on proximity of the organisation. Non- contracting participants (customers) would be contacted through interactions with the host communities of the project location, potential students and hospital staff in the case of the hostel accommodation and hospital buildings considered. Consent of the interviewees would be sought at the beginning of each interview while a declaration to participate in the research through the questionnaire survey would be obtained by a return of the completed questionnaire.

3.7

Are your participants adults? (over 18 and competent to give consent) If no, answer 3.7.1. (See guidelines)

Yes.

3.7.1 Are your participant's children or adults under 18 and not competent to give consent? If yes, why is it necessary to involve these participants?	No.
3.8 Are you offering any incentives to any of your participants, financial or otherwise? (See guidelines)	No.
3.9 How much time do you estimate will be needed from any participants? (See guidelines)	Interviews- 45 Minutes per participant Questionnaires- 30 Minutes per participant

3.10

Please list the method of data collection and analysis intended to be used

- Mixed method; Interviews and Questionnaires.
- Analysis of interview data would involve categorization, pattern identification and theme creation through the Nvivo Software.
- Analysis of questionnaire data would involve the statistical tool SPSS to identify correlations, regressions and importance of the attributes investigated.

3.11 Will all of the data collected contribute towards your results?	Yes.

Section 4: Confidentiality and data handling	
Please read methods of ensuring confidentiality in the guidelines.	
4.1 Will you ensure the anonymity of data collected from/and about participants?	Yes
4.1.1 Please explain how this will be achieved.	
Codes to represent respondents would be developed. For example, CS001, CS002, for respondents 1, 2, respectively. Also, the use of unmarked envelopes for postal communication wold be employed.	
4.2 Will you store/protect data collected from individuals e.g. password protected files?	Yes
4.3 Once your project is complete and information is no longer needed, will you destroy your data?	Yes
4.4 Will anyone else have access to the data collected?	Yes
If so, (i) please name the individuals and/or groups that will have access; (ii) why is access being given to those listed in (i)?	Dr Ezekiel Chinyio (DOS) Dr Subashini Suresh. They are my supervisors.
Section 5: Working with other parties and companies	
5.1 Will you be using data on subjects held by another party or organisation?	No
If Yes, (i) Please give details. (ii) How will you gain access to this information?	
5.2 Do you require written permission from a company, organisation or location, e.g. an employer or local authority?	No
If Yes, (i) Please complete an external agreement form and include this with your submission.	
NB: If working with another organisation or company please familiarise yourself with their Health & Safety procedures.	

Things you must be aware of:

Data Protection Act: http://www.ico.gov.uk/what_we_cover/data_protection.aspx

Freedom of Information Act: http://www.opsi.gov.uk/Acts/acts2000/ukpga_20000036_en_1

University of Wolverhampton Ethical Approval Procedural Guidelines

Checklist:

1. If you are using a questionnaire or interview sheet please include a list of sample questions with your submission.

2. In addition, please include an introductory cover letter stating some information about you, your project proposal and how your data will be used.

3. If you are undertaking a project involving a company or organisation you will need to show that you have approval from that organisation. Please include a completed copy of the External Agreement Form.

Student's Declaration Sign and date against **one** declaration **only you need to sign one of these**	
Category 0. My project involves no human participation except for myself and I agree to ensure that any information or artefact produced will not be available outside the University.	
Category A1. My project involves limited human participation and I agree to ensure that (i) any such participation is not detrimental in any way to the interests of the participants; (ii) all information collected as a part of the project will be handled in accordance with the answers that I gave to question **4**; (iii) No information or artefacts which may place anyone at risk or be detrimental to their wellbeing will be made available outside the University.	
Category A2. My project involves human participation and may present some risk to participants. I have considered alternative means of pursuing the project which do not entail this risk but believe that there is no practicable alternative. I agree to ensure that I take all necessary steps to minimise risks to participants and third parties. I agree not to proceed with any activities involving human participation until I have received approval from the Department Ethics Panel.	
Category B-E. My project does not conform to Category 0, A1 or A2. I have considered alternative means of pursuing the project which do not entail risk to human participants but believe that there is no practicable alternative to the proposal made. I agree to ensure that I take all necessary steps to minimise risks to participants. I agree not to proceed with any activities involving human participation until I have received approval from the School or University Ethics Committee, as appropriate.	

Director of Studies/Principal Investigator's Declaration Sign and date against **one** declaration **only**	
Category 0 or A1. I concur with the classification of this project as **0** or **A1** and authorise continuation of the project pending consideration by the School Ethics Committee	
Other. I believe that this project should be classified other than **0** or **A1.** I will ensure that no activities involving human participants take place until and unless approval is granted by the School Ethics Committee	

10.12 APPENDIX 11 TEST FOR NORMALITY (SKEWNESS) OF DATA SET

SECTION B1

		item6	item7	item8	item9	item10	item11	item12	item13	item14	item15	item16	item17	item18	item19	item20	item21	item22	item23	item24	item25	item26	item27	item28	item29	item30	item31	item32
N	Valid	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	502	503	503	503	503	503	503	503	503	503	503
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Skewness		-1.530	-.771	-.584	-.260	-.497	-.183	-.537	-.630	-.669	-.269	-.576	-.307	-.178	-.676	-.798	-.417	-.507	-.756	-.683	-.453	.152	-.657	-.715	.220	.252	-.996	-.797
Std. Error of Skewness		.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109

SECTION B2

		item33	item34	item35	item36	item37	item38	item39	item40	item41	item42	item43	item44	item45	item46	item47	item48	item49	item50	item51	item52	item53
N	Valid	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Skewness		-.864	-.909	-.066	-.971	-1.169	-.950	-.992	-1.113	-.891	-1.208	-1.022	-1.193	-.945	-.493	-.212	-1.084	-.874	-.871	-.679	-.925	-.636
Std. Error of Skewness		.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109

SECTION B3

		item54	item55	item56	item57	item58	item59	item60	item61	item62	item63	item64	item65	item66	item67	item68	item69	item70	item71	item72	item73
N	Valid	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Skewness		-1.464	-.679	-1.259	-.551	-.878	-1.282	-.997	-.884	-1.203	-1.027	-.205	-.644	-.269	.350	-1.170	-.266	-.654	-.544	-.799	-.630
Std. Error of Skewness		.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109

SECTIONs C1 and C2

		item77	item78	item79	item80	item81	item82	item83	item84	item85	item86	item87	item88	item89	item90	item91	item92	item93	item94	item95	item96	item97	item98	item99	item100	item101	item102	item103
N	Valid	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503	503
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Skewness		-.937	-.722	-.865	-.927	-1.060	-.423	-.044	.118	.438	-.234	-.907	-.228	-.920	-.585	-.710	.108	-.832	-.485	-1.064	-.590	-.531	-.522	-1.645	-1.668	-1.419	.167	-1.020
Std. Error of Skewness		.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109	.109

10.13 APPENDIX 12 TEST FOR LINEARITY OF DATA SET